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CORPORATE RESTRUCTURING AND R&D

HEARING

BEFORE THE

SUBCOMMITTEE ON
SCIENCE, RESEARCH AND TECHNOLOGY

OF THE

COMMITTEE ON
SCIENCE, SPACE, AND TECHNOLOGY
U.S. HOUSE OF REPRESENTATIVES

ONE HUNDRED FIRST CONGRESS

FIRST SESSION

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CORPORATE RESTRUCTURING AND R&D

THURSDAY, JULY 13, 1989

HOUSE OF REPRESENTATIVES,
COMMITTEE ON SCIENCE, SPACE, AND TECHNOLOGY,
SUBCOMMITTEE ON SCIENCE, RESEARCH AND TECHNOLOGY,
Washington, D.C.

The subcommittee met, pursuant to call, at 9:40 a.m., in room 2318, Rayburn House Office Building, Hon. Doug Walgren [chairman of the subcommittee] presiding.

Mr. WALGREN. Let me call us together and begin our hearing this morning, and, without objection, electronic recording and videotaping will be permitted in today's hearings, as provided under the rules.

Let me welcome you to our hearing on the effects of corporate restructuring on research and development in the United States. During the 1980's, corporate restructuring, including mergers and acquisitions, especially hostile takeovers and leveraged buy-outs, have been an everyday event in the business headlines. These actions have changed corporate America in its structure, perhaps irrevocably. Businesses have certainly been forced to make themselves far more lean than they were in previous decades and to justify all major expenditures in ways that they had never before.

Who would have guessed at the beginning of the decade that companies as large as RCA or Gulf Oil would essentially disappear or become subsidiaries of other corporations, or who would have guessed that conservatively managed companies would be willing to take on huge amounts of debt and even sell some of the most financially rewarding sections and divisions of their operations just to keep corporate raiders at bay?

We all know that there are both horror stories and success stories in this period, but how much do we know about the effect of these business transformations on the process of innovation and ultimately on the bringing on of new commercial products in the American economy?

The high debt loads associated with corporate restructuring have certainly led to reduced expenditures and reduced work forces. Today, we want to explore whether they have reduced corporate innovation as well. Have the cutbacks resulted in research and development reductions? and, if they have, has this, and to what extent has this, affected the ability of major companies to bring innovation into the marketplace?

Last fall, our committee asked the Office of Technology Assessment to look at this issue, and they will have testimony of their first explorations for us today.

There have been several recent analyses of the effects of corporate restructuring on corporate research. Most have shown a decline in spending for research and development after a company goes through restructuring. Some have shown that corporate restructuring has increased almost all the indexes that we want to see improved in the American economy. Some have shown that corporate restructuring has led to increased employment and increased research and development spending and, in theory, for some politicians, yielded higher tax revenues to the Government.

Our purpose today is to determine the effect corporate restructuring generally has had on the quality of corporate research and development and on a company's ability to innovate. These questions are not just academic because, as we all know, our country faces such sharp challenges from foreign competitors. We don't have the luxury of discovering years after the fact that we made a major mistake, and I know in my own district in western Pennsylvania where Gulf Oil was bought by Chevron, essentially Chevron just walked away from what was a premier research laboratory in fossil fuels, completely equipped—simply shut the door and left it without incorporating that facility in their future plans.

It's hard to believe that that kind of restructuring does not, in a serious way, diminish the innovation and the research that is going on in the private sector, and that research, as a whole, encompasses over half of the research and development spending in the United States, and so it is not a small fraction of the engine that we need to drive our society.

We want to ask how the Federal Government should relate to the questions before us. To what extent are these trends the result of Federal tax and antitrust policies, and are these policies the right ones? I know many are quick to say that these are natural forces at work and that economics should follow whatever natural laws drive it.

We have found in other areas—medicine and the environment—that we oftentime want to intervene to prevent the outcome of natural forces, and when we see the potential of the United States falling behind in world economic competitions, we had best be sure that the policies that we follow are truly the most constructive ones for our national well-being in hopes that we do not look back on this period and feel that it was a time when we lost great potential and great strength which we needed very desperately in the years ahead.

With that for opening remarks, I would like to recognize the gentleman from California for any opening comments he might like to make, and I know that he is particularly close to Dr. Miller, who will be a witness later on in the hearing today, and we are very pleased to have him, and so let me recognize the gentleman from California.

Mr. CAMPBELL. Thank you, Mr. Chairman, and I wish to compliment you; you have an uncanny ability to hold hearings on very relevant matters, and this is certainly at the very top of that list.

I will have a word of recognition and introduction of Dr. Miller, but I'd like to start with a comment on the question of the substance of the hearings today. If the takeover phenomenon is troubling from the point of view of developing research in the United

States, I think it is from two points. One would be to the extent that companies are saddled with debt through the leveraging, which is part of either the takeover phenomenon or the defense against the takeover phenomenon, then it is indeed something to be worried about. But, if so, then the focus is the leveraging and not the takeover itself. The other would be that the threat of being taken over might cause management to have a much shorter focus than it otherwise would, and I think that is a realistic concern that we have to have before us, again, whatever the means of the takeover phenomenon.

I would note that the evidence is mixed as to whether takeovers have been good or bad, and, with the chairman's permission, I would like to submit, subsequent to our hearings because I do not have it presently with me, a study that KKR—Kohlberg, Kravis and Roberts—has done showing that at least in the companies in which they have been involved research and development has increased following the takeover phenomenon.

Mr. WALGREN. Without objection, we will receive that study and review it for perhaps a summary or something appropriate for inclusion in the record. [See Appendix]

Mr. CAMPBELL. That would be excellent. I thank the chairman.

And, in connection with that, an example oftentimes raised is TWA, which may have had better management after a leveraged buy-out than before.

But my sense is that if the mechanism whereby takeovers are beneficial is analyzed, it will probably be the threat of better management, and that threat could be realized with its beneficial consequences without the increased leveraging if only our proxy rules worked better and if corporations actually did have a threat in the management, which at present may not characterize corporate America.

By way of introduction then, I am open to being persuaded on either way, and I will look forward to the testimony of these witnesses with the greatest interest. I could not think of a more important issue to analyze from the point of view of structure of corporate America today, and it is particularly a joy to be able to introduce to the Committee Dr. William Miller, which I would like to do at this time because it may be a little later before the actual testimony occurs.

Bill Miller is not only a constituent, he is a colleague on the Stanford faculty and a friend. Let the record show I am on leave and not actually being paid by Stanford University. Dr. Miller is a professor of public and private management of the Stanford Graduate School of Business. He had served as provost and vice president of Stanford as well before going over to become chief executive officer of SRI International. He has a Ph.D. as well as an honorary doctorate from Purdue; a member of the National Academy of Engineering and the Academy of Arts and Sciences; all of the attributes of a distinguished academic and business career are there, serving on the board of directors of many companies.

But in addition to all of that, let me just offer my observation to all, and to the chair in particular, that Dr. Bill Miller is the sort of person you go to for advice in Silicon Valley on any matter of com-

petitiveness or international trade, and, given the field from which one can choose in Silicon Valley, that is quite a compliment indeed.

I thank the chair.

Mr. WALGREN. I thank the gentleman from California, and we all wish we were on leave from some place. We probably are, or at least we are only temporarily here, and we are also subject to being bought out every two years, and, to the degree we are bought out, there may be some wrongful long-term effects of the leveraging at the time.

[The prepared opening statement of Mr. Costello follows:]

OPENING STATEMENT
BY U.S. REP. JERRY COSTELLO
COMMITTEE ON SCIENCE, SPACE AND TECHNOLOGY
SUBCOMMITTEE ON SCIENCE, RESEARCH AND TECHNOLOGY
JULY 13, 1989
"CORPORATE MERGERS AND RESEARCH AND DEVELOPMENT"

Mr. Chairman, with greater focus on this nation's economic standing internationally and where we plan to be in the year 2000, we must closely look at the effects that corporate mergers are having on our research and development capabilities in this country.

Today's hearing will examine whether corporate mergers are having a detrimental effect on these advances through a decline in a commitment to research and technology development. With private industry being responsible for over half the research spending nationwide, it is important that we ensure that corporate mergers do not cut down on our advances in this area.

Mr. WALGREN. Well, let me introduce our first panel to the record: Dr. Julie Gorte, who is the senior analyst at the Office of Technology Assessment. Dr. Gorte is accompanied by Dr. Robert Miller of the University of Houston—and we would like to welcome both of you to our first panel—and also William Stewart, who is the director of the Division of Science and Resource Studies for the National Science Foundation, who is accompanied by Melissa Pollak, who is a science resources analyst with the Industries Studies Group.

If you folks would come forward and join us.

As you know, as is our process here, written statements will be reproduced in that section of the record for those statements in full, and you needn't feel that if you don't cover your whole statement in your oral testimony that it will not be there for those who work with these records, and so you can feel free to focus on points, underscoring or emphasizing in any way that you feel would be best to communicate them, and we invite you to do that in anywhere from seven to 10 minutes or thereabouts, and we would appreciate your all trying to be sensitive of the time because time that one witness takes will be difficult to make up for others later on.

All right. Well, let's proceed first with Dr. Gorte.

STATEMENTS OF JULIE GORTE, SENIOR ANALYST, OFFICE OF TECHNOLOGY ASSESSMENT, ACCOMPANIED BY ROBERT MILLER, UNIVERSITY OF HOUSTON; AND WILLIAM STEWART, DIRECTOR, DIVISION OF SCIENCE AND RESOURCES STUDIES, NATIONAL SCIENCE FOUNDATION, ACCOMPANIED BY MELISSA F. POLLAK, SCIENCE RESOURCES ANALYST, INDUSTRIES STUDIES GROUP

Dr. GORTE. Thank you for asking me to come here today, I appreciate it, and I'd like to introduce also Dr. Robert Miller, who contributed an important part of the work on which the testimony I submit is based. Dr. Miller interviewed R&D managers at 19 companies, most of which had experienced some kind of merger or acquisition activities, and he can help to answer questions.

In addition, OTA is completing work on financing long-term investments in technology in our ongoing assessment Technology, Innovation, and U.S. Trade, which was originally requested by the Senate Committees on Finance and Banking and the House Committee on Banking, Finance, and Urban Affairs. My testimony is also drawn from this work.

Last year, we wrote and delivered a report that was entitled Paying the Bill: Manufacturing and America's Trade Deficit. In that, we concluded strongly that to eliminate our trade deficit with the least diminution of our standard of living, we must strengthen technology in manufacturing. The link between technology and manufacturing competitiveness is strong and well established. R&D is an important part of the technology development enterprise, and we agree with the committee's news release in saying that we are very concerned about anything that could reduce R&D. We also share the committee's concerns about things that reinforce existing

pressures to seek short-term gains because at some point this cuts into longer-term investments.

By its nature, technology development involves a great deal of long-term risky investment, and the economic and financial environment of the United States is a poor promoter of this kind of investment compared with our ablest competitors, most notably Japan and West Germany.

Mergers and acquisitions include a variety of corporate restructuring activities that many agree are good for the Nation by acting as insurance against inefficient or inept management, yet some of these activities can also have some unwanted consequences. The impact on corporate research and development is one that has received a great deal of attention, and there are mixed results from that attention.

To try to get some insight into this question, Dr. Miller interviewed 19 R&D managers of 19 companies. In some of them, M&A has resulted in curtailed research and development spending for a time and often a shorter-term focus of what remains. In other cases, restructurings have had little or no apparent impact on R&D and, in still others, R&D increased. The thing that distinguishes these outcomes is debt. Mergers and acquisitions that leave the company with high debt have had negative effects on R&D spending to date in the companies that we have interviewed. In the cases that we examined, it has also changed the R&D program qualitatively.

From the point of view of the national interest in strengthening American manufacturing technology and innovation, those qualitative changes concern us, but they are not all negative. By its nature, R&D is a messy business. It involves much exploration and many investments, some blind alleys, and some things that won't pay off, but, like anything else, it can be managed inefficiently and some companies have used the pressure exerted by takeover-induced high debt to bring focus and greater discipline in the R&D enterprise.

However, I wish to stress that better R&D management and closer ties of R&D to a company's core business or product lines can be done without the pressure of high debt or reduced spending.

Dr. Miller interviewed the R&D directors of six companies that had acquired high debt as a result of a takeover attempt, and in all these cases R&D had declined either in dollars or in intensity, that is, of percent of sales, or both. These R&D managers mostly agreed that the reductions had helped to increase the efficiency or focus of their operations, but many also felt that the cuts had gone well beyond simply streamlining the enterprise.

There is also a danger in too heavy emphasis on development projects that must pay off in the short run. Many of today's successful products were the culmination of many years and occasionally decades of R&D. Companies that change their focus to support fewer long-term development projects may find in a few years that they have fewer new products coming on line. This will be less true, of course, if the shortening of the time horizon and/or spending reductions in R&D are temporary.

We don't know at this point how lasting some of the effects will be, and I should add that some of the effects will only be known—

the effects could be different, depending on what happens in the economy; if there is a recession, we might see much more severe effects than if there isn't. In the interviews with R&D managers of the three companies that had had a friendly merger, on the other hand, we saw increased R&D expenditures with occasional modest cuts to eliminate duplication in R&D.

Finally, I should point out that high debt M&A activity is only a part of a general financial and economic environment that has been corrosive to long-term investment in research, development, and commercialization. There is little agreement on how big a role merger and acquisition activity plays in that environment, although its direct role—that is, the cuts in R&D in manufacturing companies that have undergone an actual takeover attempt—is small. There is no consensus on how important the chilling effect of M&A is or to what extent R&D is depressed because of a perceived need to keep stock prices up.

[The prepared statement of Dr. Gorte follows:]

STATEMENT OF

DR. JULIE FOX GORTE, PROJECT DIRECTOR

OFFICE OF TECHNOLOGY ASSESSMENT

BEFORE THE

SUBCOMMITTEE ON SCIENCE, RESEARCH AND TECHNOLOGY

COMMITTEE ON SCIENCE, SPACE, AND TECHNOLOGY

UNITED STATES HOUSE OF REPRESENTATIVES

July 13, 1989

MERGERS AND ACQUISITIONS: IMPACTS ON RESEARCH AND DEVELOPMENT

Mr. Chairman, OTA appreciates the opportunity to appear today. The work we report on today is part of our assessment, titled Technology, Innovation, and U.S. Trade, requested by the Senate Committee on Finance, the Senate Committee on Banking, and the House Committee on Banking, Finance, and Urban Affairs. In that work, we examine many of the factors that affect American investment in manufacturing technology, including research and development, innovation and commercialization, and capital equipment. We have concluded, in an interim report entitled Paying the Bill: Manufacturing and America's Trade Deficit, that improvement in technology is a critical key in our overcoming our massive merchandise trade deficit without sacrificing our standard of living. We have concentrated some of our ongoing work specifically on the effects of mergers and acquisitions on research and development, at the request of your Committee.

Corporate restructuring includes a variety of activities: friendly mergers, hostile takeovers, leveraged buyouts, and often subsequent sell-offs. It is widely acknowledged that some level of these activities is needed, that they act as insurance against inefficient or bad management, and that removing or even tampering heavily with the rules that permit takeovers and mergers might harm American competitiveness. However, these actions may have some unwanted impacts as well. The impact of takeovers, mergers and LBOs on corporate research and development has received considerable attention, with mixed conclusions. OTA interviewed R&D managers at 19 companies in order to gain some insight into this issue. In some of these companies, M&A has resulted in curtailed research and development for a time, leading to reduced R&D spending, fewer R&D staff, and a shorter-term focus to what remains. Other restructurings have had little or no apparent effect on R&D, and in still other cases, R&D has increased. The distinction between these outcomes is often debt: mergers or acquisitions that leave the company with high debt had negative effects on R&D spending in the cases OTA examined, and have changed the R&D program qualitatively as well. High debt is often a consequence of a hostile takeover bid, or a defense against one.

In the 19 manufacturing firms OTA examined, most have been recently involved in some kind of merger or acquisition activity. For comparison, we selected a few that had not been in such activities, though the sample was not drawn in order to be statistically significant, and there was no formal control group. We sampled most heavily companies that had acquired a lot of debt through M&A activity, in order to examine the connection of high debt to changes in R&D. Our results support the contention that R&D is prone to suffer as a result of heavy debt loads. We were also struck by the fact that

M&A activity is only one thing that reins in R&D spending. Mergers and acquisitions are a part of a general financial climate that has slowed down increases in R&D spending, and that reinforces the short term focus of American managers.

The firms included Stauffer Chemical, Owens-Corning Fiberglas Corporation, Radian Corporation, Polaroid Corporation, Tenneco, G. D. Searle and Company, USG Corporation, Hoechst Celanese Corporation, Proctor and Gamble Company, Union Carbide Corporation, Phillips Petroleum Company, Owens-Illinois Company, Borg-Warner Automotive, Inc., Datapoint Corporation, Reliance Electric Company, Zenith Electronics Company, Caterpillar, Inc., Baker Hughes Incorporated, and Goodyear Tire and Rubber Company. Six were companies that had mounted defenses against a takeover, three were hostile takeovers, three were LBOs, and three were friendly takeovers or mergers.[1] In addition, to provide some perspective, three firms that had experienced much intensified international competition were interviewed, two in which there was talk of a possible takeover, and one where business had continued as usual.[2]

In the cases covered in this survey, managers of the firms that had much increased financial leverage (debt) thought some paring--or focusing--of the R&D enterprise was desirable, but that the cutbacks they experienced often were deeper than was consistent with remaining competitive.[3] And this is

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[1]There is some duplication in these numbers, because some firms were affected by more than one event.

[2]Except where noted, the information in this section relies on Miller, op. cit.

[3]Robert R. Miller, "The Impact of Merger and Acquisition Activity on Research and Development in U.S.-Based Companies," Contractor Report Submitted to the Office of Technology Assessment, June 14, 1989.

exactly the crux of the matter we're talking about today: how much R&D is necessary to not only maintain, but improve competitiveness? And how much is at risk as a result of the current wave of mergers and acquisitions?

The link between technology and competitiveness is strong and well established. Advanced nations with high standards of living and developing nations that want to raise their incomes both know that technology is a major--often the principal--source of competitive advantage they can rely on. Other sources of advantage include labor costs, capital costs, and natural resource endowments. Labor cost advantages disappear by definition as a nation develops economically. A capital cost advantage, with the increasingly international nature of capital markets, can be sustained only through vigorous regulation and penalization of some sector for the benefit of another. For example, Japanese consumers were encouraged to save and penalized for borrowing to consume, enabling corporations to invest at preferential rates throughout the Japanese high growth period (through the 1960s and early 1970s). As for the natural resouces endowment, it is a slender reed: natural resources may be depleted, or they may require increasing inputs of technology or capital to extract.

A nation cannot build or maintain any kind of technological advantage without engaging in R&D, although the appropriate level varies with time and by industry. Of course, it is possible to spend too much on R&D, or to waste the effort regardless of the level of spending. Nonetheless, there is strong evidence that American civilian R&D spending is, if anything, too low to maintain the competitiveness of U.S. firms. Our ablest competitors--Japan and West Germany, and increasingly, Taiwan and South Korea--spend much higher

proportions of their GNP on civilian R&D than America does,[4] and the divergence has widened in the 1980s. These nations see themselves in a technology race with each other and with America, and their governments and corporations are spending vigorously on science and technology projects. So, while it would be foolish to presume that more R&D is always better, it is imprudent to be complacent about forces that limit or reduce R&D spending.

Effects on Research and Development

In the companies we interviewed, research and development were particularly vulnerable when companies acquired a great deal of debt, or when profits were squeezed by competitive pressure. In all six companies that had resisted a hostile takeover, leverage (debt) increased, and R&D declined, either in dollars or in intensity (percent of sales), or both. The R&D managers generally agreed that the reductions had helped to increase the efficiency or focus of their operations, but most also felt that the cuts had gone well beyond what would have been needed simply to refocus. Moreover, in every one of the six cases, the R&D managers acknowledged that longer-term efforts had been cut back in favor of efforts that promised a more immediate payoff.

One such company is Owens-Corning Fiberglas Corporation, a company whose consistent cash flows made it an attractive takeover target. The company fought off the takeover, becoming much more highly leveraged in the process. R&D spending was cut almost in half, while asset sales cut the size of the

[4]For example, U.S. Congress, Office of Technology Assessment, Commercializing High-Temperature Superconductivity, OTA-ITE-388 (Washington, D.C.: U.S. GPO), found that "Japanese companies place high priorities on technology as a competitive weapon...business-funded R&D in Japan totals 2.1 percent of gross national product, compared with 1.4 percent here."

whole company by about 30 percent. The focus also changed to product support, and the company is fortunate that previous investments in R&D left a number of new products in the pipeline. Accordingly, the productivity of the R&D enterprise still seems very high, but this could be a false prognosticator of the company's long term performance, unless it is able in the future to support longer-term development of new products.

Polaroid also has fought off a hostile takeover attempt. The attempt is so recent that all outcomes are not yet known. Polaroid became a takeover target apparently as a result of its decade-long record, before 1986, of flat sales and earnings. Before the takeover attempt, Polaroid had already implemented several changes aimed at improving its performance, including refocusing R&D on specific needs of defined businesses. Cost-control measures were introduced, and some existing development work paid off handsomely, with the introduction of the new Spectra camera in 1986.[5] Profits trebled between 1985 and Polaroid's most recent report. The takeover threat is viewed by some company people as accelerating plans that were already underway. Previous cost-control measures had meant staff reductions, but after the takeover defense began, Polaroid dropped a further 2,000 employees, including 400 from R&D. R&D has declined from about 8.5 percent of sales to about 7.5 percent, and exploratory research in a number of areas has been dropped altogether.

R&D also was a bit lower in the years immediately following a takeover in the firms that had undergone LBOs, although the results were difficult to sort out in one of the three cases, where the post-LBO company was a much smaller firm than it had been before the restructuring. In many LBOs,

[5]Brian Dumaine, "How Polaroid Flashed Back," Fortune, February 16, 1989.

companies are taken private by a group of investors--often, their own management--by using borrowed money to buy back company shares. By definition, LBOs involve high debt. But they also often leave the company in the hands of managers who know the business and want to continue to manage the firm. One would therefore expect managers who had taken their own firms private would understand the contribution of R&D to the firm's performance, and support it if it were considered critical. In two of the three cases OTA examined, R&D was considered very important to the firm's success--in one case, that of Owens-Illinois, R&D could be considered a profit center.[6] In the case of Owens-Illinois, R&D spending was slightly less after the LBO, but better focused, according to the R&D manager. Owens-Illinois is a technology leader in its industry, but the glass industry--its major business--is not technology intensive; it spent about 1 percent of sales on R&D before the LBO, and slightly less afterwards. In the second case, the company was heavily dependent on technology, and accordingly it spent about 4 percent of sales on research and engineering before its LBO.[7] Nonetheless, expenditures on R&D declined nearly 25 percent in absolute terms and by one-third in percent of sales since the LBO. At the same time, the emphasis on applied engineering increased; if R&D and applied engineering are combined, the intensity of expenditure was just about maintained through the LBO, falling from 4 percent to 3.9 percent; the level of expenditure on the combined activities increased from $57 million to $62 million. The level of support for R&D, while

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[6]Although this is not true in a strict accounting sense, Owens-Illinois technology license income more than covers the company's R&D expenditures.

[7]This figure combined R&D and application engineering. In 1986, R&D accounted for 45 percent of the combined total, or 1.8 percent of sales.

diminished, has only been possible because of the firm's positive business fortunes since its LBO two years ago. A recession could have serious consequences for R&D, and indeed, for the company as a whole. In a third case, R&D was supported in percentage terms but reduced in absolute amount, since assets were sold off to pay down debt. The sale of assets to service debt was a common feature of all three LBOs in OTA's sample, and the fate of R&D in the divisions that were sold off is unknown.

This reluctant cutback of R&D to meet cash flow requirements can happen even without the pressure of high debt service. It happened to Caterpillar, a company that has been strongly challenged by a tough competitor, Komatsu of Japan, in the 1980s. In addition to Komatsu's challenge, there were several things that made the 1980s a tough decade for Caterpillar. The high dollar in the first half of the decade cramped Caterpillar's overseas sales, as did the international debt crisis that dried up markets for large construction projects in Latin America. OPEC's troubles attenuated the heavy construction activity of the Middle East. The effect of all this was that Caterpillar, a well managed and technically competent company that reacted early and aggressively to its Japanese competition, lost almost $1 billion in 1982, 1983 and 1984. Spending on R&D suffered as sales went down. In the early 1980s, the company spent about 6 percent of sales on R&D, making it a relatively high tech company. By 1987, R&D had been cut to only 3.6 percent of sales, and sales still have not reached the heights of 1980. Total debt has declined, so it is fair to say that Caterpillar's troubles have not stemmed directly from any takeover activity. However, it is not immune from financial market pressures: a poison pill is in place. Some of the firm's managers have come to believe that the stock price is a more important matter than was the case a

decade ago. One could speculate that this may be one reason why R&D expenditures have not increased, even though sales have, since 1983. Komatsu, despite having lower sales than Caterpillar, is beginning to spend more on R&D, and some in Caterpillar are concerned that this could narrow their technical lead on Komatsu.

So, OTA finds it plausible that some of the reason for the lackluster growth in R&D spending stems from causes other than high-debt takeovers or defenses against them. We don't know how much, but it seems likely that, so far, the impact of actual takeovers is probably much smaller than that of high capital costs and competitive pressures, simply because more manufacturers are affected by stiff foreign competition than by actual takeover attempts. In addition, few large, high technology manufacturing companies have experienced a tender offer. In contrast to the cases of defenses against takeovers or LBOs, friendly mergers, in OTA interviews, were more likely to end up with increased R&D spending than with cuts. If there were cuts, they were usually justified by elimination of research that was duplicative, or not related to product lines the post-merger company wishes to emphasize[8]. In one case, that of Hoechst's purchase of Celanese Corporation, R&D was supported at higher levels after the acquisition (increasing at 10 percent annually), and strong R&D was an important reason for the purchase.

We should also consider another important point. What happens to R&D qualitatively can be as important as the level of spending. Here, the results of mergers and acquisitions also seem to vary depending on what happened. In

[8]It should be noted that even this outcome is not universally regarded as benign. Competition in R&D among many companies is more likely to result in vigorous industrial innovation than that of one or a few companies, no matter how well funded or technology-intensive.

the cases we examined, if the takeover or its defense left the company with high debt and pared-back R&D, their R&D was also focused more on existing product lines and shorter-term payoffs. This is not necessarily bad. In some companies, R&D was viewed (even within the company) as too diffuse or speculative, and in a couple of cases, efforts to refocus research began even before the takeover attempt. It is hard to argue against making anything more efficient, R&D included. Yet R&D can be focused and made more efficient without cutting it back, as DuPont exemplifies. The company was known for long-term research and product breakthroughs, nylon being a prime example. However, nylon was a product ahead of its time, and DuPont had to teach its customers to use it. Later, when it tried the same strategy with Kevlar, it was less successful: it invested heavily in the development and production of Kevlar, but the market did not respond to DuPont's development efforts as the nylon market had. Partly as a result, and no doubt due to other causes and strategic decisions as well, the company decided to refocus its research on products that have fairly well defined markets. This, however, does not necessarily imply shorter term research; DuPont continues long-term basic research on things like materials to replace metals, and ways to replace CFCs with gases that do not destroy ozone. And there was no cutback--in fact, R&D continued to rise as a percentage of sales at DuPont.[9]

Where does this leave us? For the companies we examined, hostile takeovers, and defenses against them, increased debt, which in turn usually resulted in cuts in R&D spending and some redirection. Some of the

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[9]David Webber, "DuPont Bets Its Future on Massive R&D Expansion," Chemical and Engineering News, February 6, 1984, and personal communication with DuPont representatives, 1989.

redirection was positive, and some is worrisome. The amount of merger and acquisition activity is significant but not overwhelming in manufacturing, and it has not been concentrated in technology intensive industries.[10] Whether or not firms in industries that would meet any of the Department of Commerce's definitions of high-tech by R&D criteria--for example, the most restrictive definition includes those that have R&D-to-sales ratios more than twice the average for all industries--are represented proportionally is not known.

But even if technology intensive companies were untouched by mergers and acquisitions, there is cause for concern. Even in industries where the average level of R&D spending is only, say, two percent of sales, it may be important to keep up that level of spending to remain competitive. Companies that do not keep up technologically can be vulnerable in the long run, even in industries not considered high-tech.

The effect of the current merger and acquisition activity on R&D and technology development may be more pervasive than past waves of mergers. Many observers make the point that the current wave of M&A activity is different than that of the past. Conventional economic wisdom has it that takeovers are necessary to correct the ills of bad management, yet Kohlberg, Kravis and Roberts, a firm specializing in LBOs, makes it clear that they are looking for well managed companies in selecting candidates.[11] There is conflicting evidence on how much M&A activity is aimed at poorly managed companies, and how much at those that are well managed; the matter is not resolved. If there

[10] Bronwyn Hall, "The Effect of Takeover Activity on Corporate Research and Development," in Alan J. Auerbach, ed., Corporate Takeovers: Causes and Consequences, (Chicago: University of Chicago Press, 1988).

[11] "Presentation on Leveraged Buyouts by Kohlberg, Kravis ad Roberts," January 1989, p. 5-2.

is a belief that well managed companies are subject to unwelcome takeover attempts, even managers of well managed companies may not feel that good management is any assurance of safety, and may act defensively in advance of any overt action. Defensive action, in turn, included downward pressure on R&D spending in the cases OTA examined. So far, the damage induced by this pressure is not obvious, but that may be due to the recent onset of much current takeover activity. If reduced spending on R&D resulting from mergers and acquisitions hurts, we would not expect to see the wounds until the 1990s and beyond. OTA finds it plausible that, if managers perceive a pervasive threat of takeover, studies that project little impact on R&D resulting from M&A will prove to be flawed. If, as many corporate spokesmen assert, M&A activities may force companies to manage for short term profits and discourage investment in longer term, risky ventures like R&D, this would not be apparent in studies that compare R&D in companies involved in M&A activity directly with those that are not.

Finally, many observers argue that the general financial and economic climate of America is more corrosive to R&D support than are mergers and acquisitions specifically. Certainly this is true if we look only at the direct effects of M&A. High capital costs also tend to force a shorter term time horizon. This contributes to American managers' unwillingness to make investments in longer term R&D. Even small differences in cost of capital can have pronounced effects on the rate of return needed to justify an investment.

This can have important effects on the time horizons of American managers, along with other factors.[12] According to a recent report by MIT, there are several other factors.

> "In addition to the usual business risks, firms sometimes must also consider the effects of uncertainties in government protection from dumping or other trade abuses, patent protection, environmental or other liabilities, exchange rates, and competitors' plans to expand market share at almost any cost...We believe that such factors may have played a significant role in the investment-decision process in some U.S. industries."[13]

The threat of takeovers is only a part of this climate. With a growing and large share of American firms' capital owned by pension funds and mutual funds, firms may be increasingly encouraged to maximize their short term profit, believing that the market would penalize their deferring current profits for longer term gains. This argument, in turn, is based on the widely held belief that pension and mutual fund managers have little loyalty to the companies in which they invest, and are evaluated on the basis of the short-term performance of their portfolio of investments.[14] Since M&A is only part of the financial and economic climate that discourages long term research, development, and investment, remedies are perhaps better directed not against M&A, but against the shortsightedness presently fostered by financial markets.

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[12]This information on the possible effect of government actions, takeovers and institutional investment comes from Michael Dertouzos, Richard K. Lester, and Robert M. Solow, Made in America: Regaining the Productive Edge, (Cambridge, MA: The MIT Press, 1989).

[13]Ibid.

[14]Ibid.

Mr. WALGREN. Thank you very much for that summary, and let's turn to Mr. Stewart, and then we will come back for some discussion.

Mr. Stewart.

Mr. STEWART. Thank you, Mr. Chairman.

With me this morning is Ms. Melissa Pollak, who is one of our analysts and is also the author of the study upon which the testimony I'm about to give is based. I have a detailed statement for the record which I will summarize briefly.

Industry performs over 70 percent of total U.S. R&D and provides half of the funds spent annually on R&D in the United States. Recently, after a decade of annual growth averaging 5.8 percent after adjustment for inflation, we observed two years of virtually no overall growth in company R&D funds. The figure for 1987, about $55 billion, was almost exactly the same as in 1985 and 1986. As you can see from chart 1, this is clearly a break in the long-term trend of the earlier period when substantial growth was maintained even during the recession of the early eighties.

We noted at this time that the development occurred during the time of frequent reports of mergers, leveraged buy-outs, and other types of restructurings among some of the leading industry R&D performers. Using data from our annual survey of industrial research and development, we examined individual company data to identify possible effects these restructurings had on industry's financing of R&D. A copy of that report is provided for your hearing record.

Specifically, we were looking for evidence, first, of reductions in R&D support among those companies that had undergone mergers, LBO's, or other restructurings, and, second, of different patterns of support for these affected companies and the other major industrial R&D performers. We found both. Unlike some of the other studies that looked at the effects of mergers and LBO's, we concentrated on the impact these restructurings had on total industrial R&D funding rather than on how restructurings affect individual firms. We looked, therefore, only at those firms that account for 90 percent or so of the industrial R&D performance.

Among the 200 largest R&D performing companies, we identified 33 firms that had merged into 16 resulting companies, plus eight additional firms that had been restructured since 1984. Each of the 16 merged firms had R&D expenditures exceeding $100 million. The eight companies involved in other restructurings had smaller programs ranging from $25 million to $250 million. Together, these 24 firms accounted for almost 20 percent of total R&D funding spent by all firms in 1987. So we feel this is a significant group of companies to study, especially the 16 merger firms.

We found that these 24 companies had a combined 5.3 percent reduction in R&D spending even in current dollars between 1986 and 1987. In contrast, the remaining top 200 R&D performing companies reported a 5.4 percent increase in R&D expenditures during that period. Charts 2 and 3 present these data graphically.

The trend in employment of R&D scientists and engineers is similar. Almost all the firms that reported reduced R&D spending also reported a decline in scientists and engineers. In almost all cases, however, the cutback in personnel was less than the reduc-

tion in R&D funds. For these companies, the decrease in R&D personnel was 4.1 percent between 1986 and 1987 while total industrial employment of scientists and engineers increased 1.8 percent in that period.

These findings are corroborated by reports from the members of our Industrial Panel on Science and Technology who represent companies involved in mergers. These managers were more likely than other respondents to report a decrease in their companies' R&D budgets and to cite the merger as a reason for the decline.

The data I have presented describe only what happened during 1986 and 1987. They do not tell us what the long-term effects of mergers and other restructurings will be. Indeed, it may be that further data and further study will show that the reductions do not represent actual cuts in R&D; the firms may simply be eliminating duplication in their programs.

In addition, the reductions almost certainly reflect other factors, such as reduced sales, increased competition from abroad, and the desire for short-term profits. We do not have data to assess accurately the long-term effects of mergers relative to other factors, but we will continue to track the companies involved.

Returns from our 1988 industrial R&D survey are coming in now, and we are watching carefully for changes in support patterns from these firms. As soon as these data are in and analyzed, we will provide you with our findings.

I would also add that NSF is pleased that there are others studying this complex issue, such as the other panelists appearing before the subcommittee this morning. I would note that I recently learned that Dr. Bronwyn Hall will be extending her previous work on this topic under a grant from the Economics Program of the Foundations Division of Social and Economic Science, and we indeed look forward to seeing the results of Dr. Hall's further research.

In closing, I would emphasize that any reduction in our industrial research investment when we face increased competition from abroad and increased R&D spending by our trading partners is, indeed, disturbing. That is not the right direction for us to be going, and it is a matter of concern.

Thank you, Mr. Chairman.

[The prepared statement of Mr. Stewart follows:]

TESTIMONY

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NATIONAL SCIENCE FOUNDATION

COMMITTEE ON SCIENCE, SPACE, AND TECHNOLOGY

SUBCOMMITTEE ON SCIENCE, RESEARCH AND TECHNOLOGY

U. S. HOUSE OF REPRESENTATIVES

JULY 13, 1989

"Effects of Corporate Restructurings on R&D Support"

I appreciate the opportunity to discuss a recent National Science Foundation (NSF) study that examined the impact of mergers, leveraged buyouts, and other types of restructurings on industry's financing of research and development. The study was conducted at the request of Chairman Markey of the Subcommittee on Telecommunications and Finance, House Committee on Energy and Commerce, using data from the Foundation's annual Survey of Industrial Research and Development.

Among other responsibilities, the National Science Foundation is charged with providing analytical data on scientific and engineering resources. We use several sources of information on industrial research and development, of which the most extensive is an annual Survey of Industrial Research and Development done for the Foundation for the past thirty years by the U.S. Bureau of the Census. We supplement this with information gathered through annual polling of our Industrial Panel on Science and Technology, which includes representatives of about 100 of the largest R&D-performing companies, and with information obtained from R&D directors.

Industry performs over 70 percent of total U.S. R&D, and provides half of the funds spent on R&D in the United States each year. Recently, for the first time in a decade, we were surprised to observe zero real growth in industry's use of its own funds for research and development. Industrial firms invested an estimated $54.6 billion of their own funds in research and development in 1987. After allowing for inflation, this was almost exactly the same amount as in 1985 and 1986. In contrast, industrial R&D funding climbed steadily during the preceding decade, averaging 5.8 percent

per year in real terms. Because this trend was maintained even during the recession in the early 1980s, the break in the trend after 1985 is especially disturbing. (Chart 1)

A possible explanation for this break in the long-term trend is that the recent increase in corporate mergers and restructurings (including LBO's) has reduced real support for R&D in the affected companies -- at least temporarily, until the effects of the mergers and restructurings have run their full course. The data we have tend to support this hypothesis.

We have examined data for those companies involved in mergers, LBOs or other restructurings during 1984, 1985, and 1986. Only the 200 largest R&D performing companies were studied, because these firms account for almost 90 percent of industrial R&D spending in the U.S.

From among the 200 firms, NSF and Census Bureau staff identified 33 firms that had merged into 16 resulting companies, plus eight additional firms that had been restructured (including several LBOs or stock buybacks). Each of the 16 merged firms had R&D expenditures exceeding $100 million; 7 ranked among the largest R&D performing companies in 1987, each spending more than $350 million.

The eight companies classified as LBOs or other restructurings had smaller R&D programs, ranging from $25 million to $250 million. It is important to note that this group of companies does not include any that sold off significant R&D-performing divisions during the period examined. Companies that sold off divisions were eliminated from the study in order ensure consistent data from one time period to the next.

The 16 mergers and the eight firms involved in LBOs or other restructurings accounted for almost 20 percent of the total $54.6 billion spent by all firms in 1987 ($9.2 billion and $600 million, respectively). This is a significant group of companies to study, although the focus should be on the merger firms: the LBO firms are not among the major R&D performers and thus are a fairly small part of the picture.

The result of this analysis is disturbing. These 24 companies had a combined 5.3 percent reduction in R&D spending, even in current dollars, between 1986 and 1987. The decline in real terms amounted to 8.3%. In contrast, the remaining top-200 R&D-performing companies reported a 5.4 percent increase in R&D expenditures during that period. (Charts 2 and 3)

The effect of merger activity may also be seen at the industry level. Six of the 16 mergers involved companies classified in the transportation equipment industry. These companies had a 5.5 percent reduction in current dollars in R&D spending between 1986 and 1987. In contrast, R&D funding in the remainder of the transportation equipment industry rose 2.4 percent between 1986 and 1987. Similarly, in the chemicals and pharmaceutical industry, companies affected by mergers and other restructurings had a 4.5 percent increase in R&D spending whereas the rest of the industry reported a 9.8 percent increase.

The trend in employment of R&D scientists and engineers is similar. Almost all the restructured firms that reported reduced R&D spending also reported a decline in scientists and engineers. In almost all cases, however, the cutback in personnel was less than the reduction in R&D funds. For these companies, the decrease in R&D professional personnel was 4.1 percent between 1986 and 1987, whereas total industrial employment of R&D scientists and engineers increased 1.8 percent during that period.

Reductions in personnel may be less than reductions in R&D funding because companies may tend first to cut other expenditures -- especially instrumentation and facilities. Failing to make such investments, however, will soon cause a laboratory to become less productive. Researchers need state-of-the-art equipment in order to be most effective.

For the past two years, we have asked those members of our Industrial Panel on Science and Technology who represent companies involved in mergers to assess the mergers' impact on their companies' R&D support. These polls reveal that R&D directors representing merged companies were more likely than other respondents to report a decrease in their companies' R&D budgets, and to cite the merger as a reason for the decline.

The data I have presented describe only what is happening at the present time. They do not tell us what the long-term effects of mergers and restructurings will be. A possible interpretation, for instance, is that the cutbacks reported do not represent actual reductions in R&D effort; these firms may simply be eliminating duplication and inefficiency in their R&D programs.

In addition, the changes we have observed are recent. While it is clear that restructured companies are generally reporting reductions in R&D support, the reductions almost certainly reflect other factors as well. For example, we have been told by R&D directors in industries such as petroleum that disappointing sales have restricted the resources available for R&D. Increased competition from abroad and the desire for short term profits may also be factors.

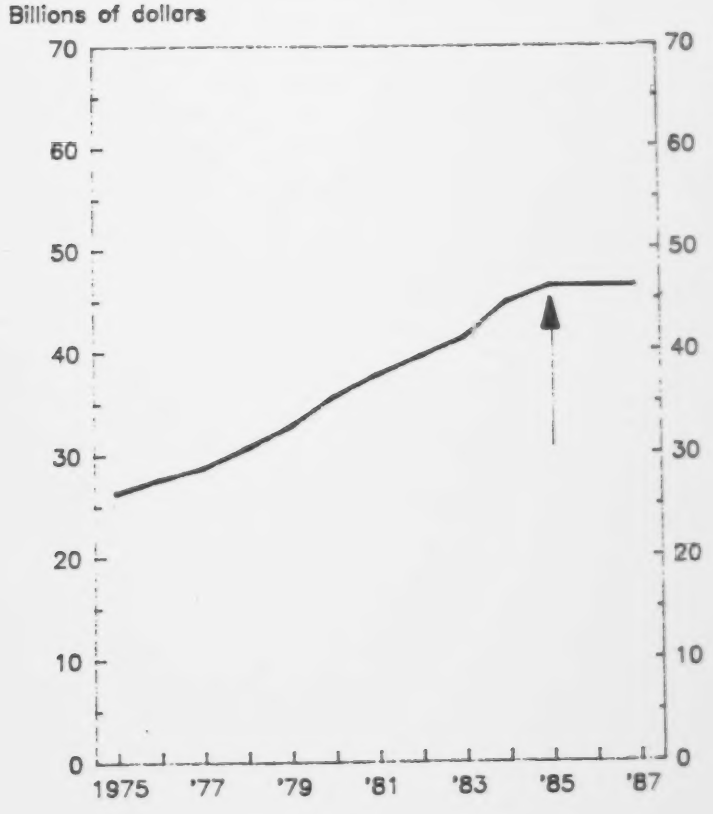
A drop in R&D funding in the computer industry in both 1986 and 1987 was another factor partially responsible for the lack of real growth in industrial R&D spending. After many years of above average increases in R&D expenditures by this industry, it appears to be on a plateau. According to industry officials, R&D activity should soon show a turnaround.

It is too early to say confidently that restructurings are the major factor behind the cutbacks in R&D spending. Neither we nor other researchers have data for a long enough period to accurately assess the effect of restructurings relative to other factors. We will continue to track the companies in our study and any additional restructurings that occur over the next few years so as to better assess the impact of mergers and LBOs on industrial R&D performance.

But it is worrisome to see our industrial research investment declining when we face increased competition from abroad and increased R&D spending by our trading partners.

CHART 1

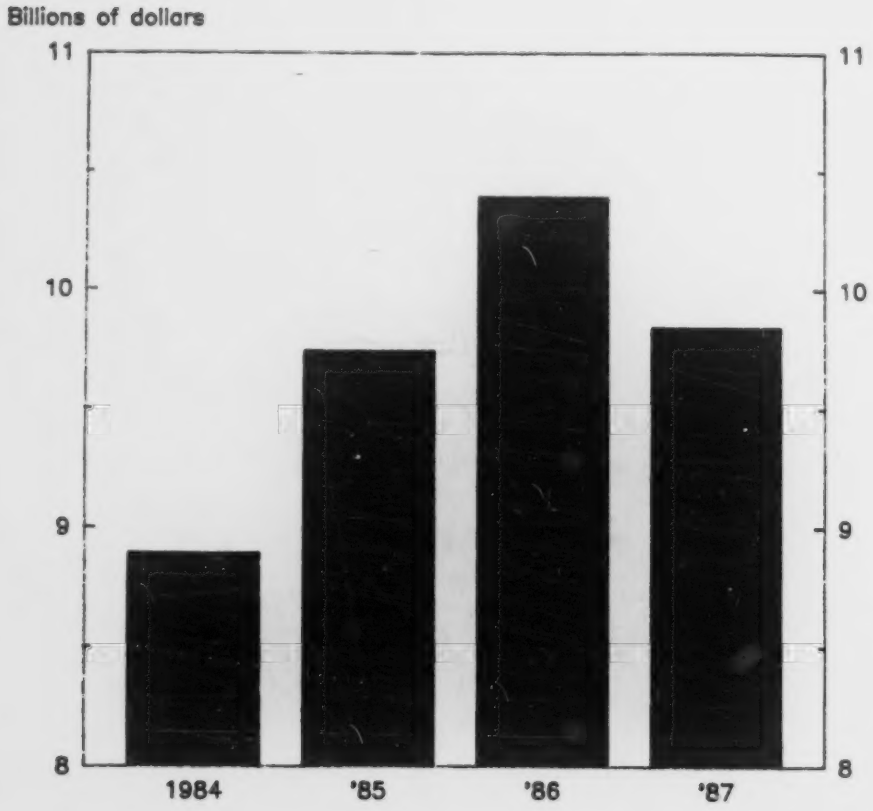
Companies' own R&D expenditures in constant 1982 dollars



SOURCE: National Science Foundation, SRS

CHART 2

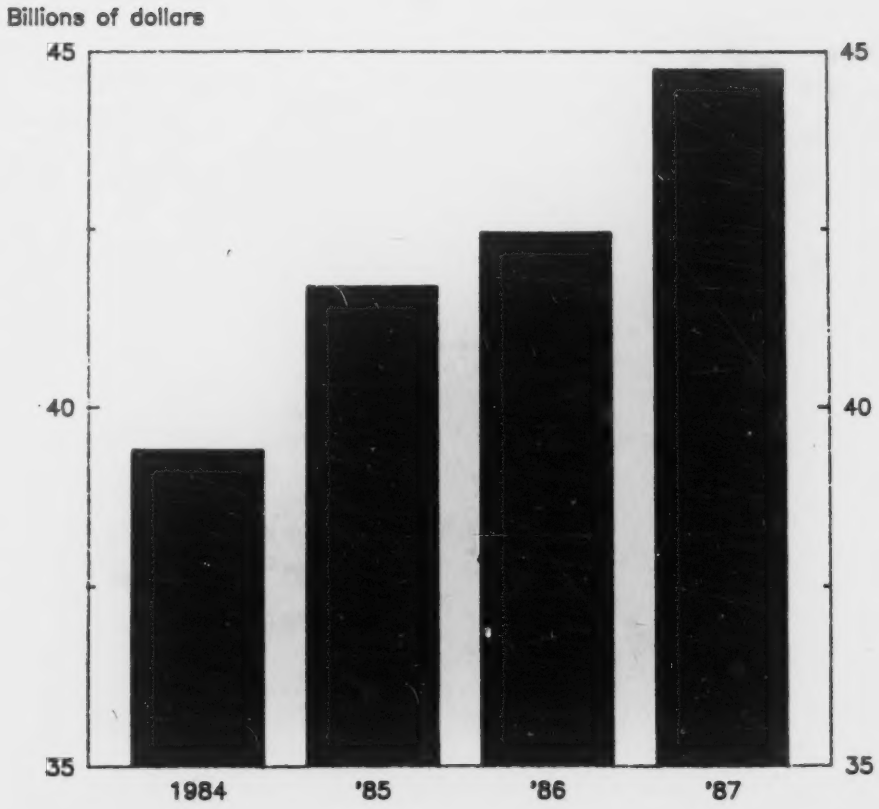
Restructured companies' R&D expenditures



SOURCE: National Science Foundation, SRS

CHART 3

All other companies' R&D expenditures



SOURCE: National Science Foundation, SRS

An Assessment of the Impact of Recent Leveraged Buyouts and Other Restructurings on Industrial Research and Development Expenditures

Prepared by the National Science Foundation for the Subcommittee on Telecommunications and Finance, House Committee on Energy and Commerce

February 1, 1989

In response to a request from the Subcommittee on Telecommunications and Finance of the House Committee on Energy and Commerce, National Science Foundation staff examined data provided by the 200 leading U.S. R&D-performing companies for the annual Survey of Industrial Research and Development. All industries were included, but only the transportation equipment and chemicals (including drugs and medicines) industries are mentioned separately, because Title 13 of the U.S. Code prohibits disclosure of information that could reveal identities of individual companies.

- Following ten years (1975-85) of increases averaging 5.8 percent annually after adjustment for inflation, real growth in company funds for research and development has all but disappeared, according to data from the National Science Foundation's (NSF) annual Survey of Industrial Research and Development. Analysis of the data shows that reductions in R&D expenditures by companies involved in mergers, acquisitions, and other restructurings including leveraged buy-outs (LBOs) appear to be a major factor responsible for the lack of real growth in industrial R&D spending in the mid-eighties.

- Industrial firms invested an estimated $54.6 billion of their own funds in research and development in 1987, virtually the same level of spending as in 1985 after adjustment for inflation. Of the 200 companies that together account for almost 90 percent of total company R&D funds, 16 large R&D performers were identified by NSF staff as recent mergers. Each of these 16 firms spends more than $100 million in company funds on research and development. These 16 firms, together with an additional 8 firms that were involved in LBOs or other restructurings and which also rank among the leading 200 R&D-funding companies, accounted for almost 20 percent of the total spent by all firms in 1987 ($9.2 billion and $600 million, respectively).

- These 24 companies had a combined 5.3 percent reduction in R&D spending in current dollars between 1986 and 1987. In contrast, all other R&D-performing companies reported a 5.4

percent increase in their R&D expenditures during that period.

- Eleven of the 16 mergers occurred between August 1985 and September 1986, and five occurred either in 1984 or in early 1985. For the one-, two-, or three-year period after the merger, nine of these companies reported significant reductions in their R&D budgets, four had increases, and three had little or no change. In current dollars, these 16 combinations of companies together had a 4.7 percent annual reduction in their own R&D expenditures, whereas R&D spending by all U.S. companies rose 3.3 percent between 1986 and 1987.

- The eight companies involved in leveraged buy-outs, buy-backs, or major restructurings (to avoid becoming targets of takeovers) have R&D programs ranging in size from $25 million to $250 million. Each of these firms had a significant reduction in R&D spending between 1986 and 1987. Together, the total decline was 12.8 percent.

- Mergers, acquisitions, and other restructurings had a dampening effect on their respective industries' R&D performance. For example, 6 of the 16 mergers involved companies classified in the transportation equipment industry. These companies had a 5.5 percent reduction in current dollars in R&D spending between 1986 and 1987. In contrast, R&D funding in the remainder of the industry rose 2.4 percent between 1986 and 1987. Similarly, in the chemicals (including drugs and medicines) industry, companies affected by mergers, acquisitions, and other restructurings had a 4.5 percent increase in R&D spending whereas the rest of the industry reported a 9.8 percent increase.

- Decreases in R&D funding also have an impact on employment of R&D scientists and engineers. The trend is similar to that for R&D funding. Almost all firms that had a reduction in R&D spending also reported a decline in their employment of R&D scientists and engineers. In almost all cases, however, the cutback in personnel was somewhat less than the reduction in R&D funds. For these companies, the decrease in R&D professional personnel was 4.1 percent between 1986 and 1987, whereas total industrial employment of R&D scientists and engineers increased 1.8 percent during that period.

- It should be noted that currently available information does not permit an assessment of long-term effects of mergers and acquisitions on company-sponsored R&D activities. For example, a few company officials have indicated that the cutbacks reported may not represent actual reductions in R&D effort; instead these firms may simply be eliminating duplication and inefficiency within their R&D programs.

R&D expenditure data
for selected restructured companies

Type of change	Number of companies	1987 company R&D funds	1986-87 change	Comparison with other top 200 companies
Merger	16	$9.2 billion	-4.7%	{ +5.4%
LBO/other	8	$600 million	-12.8%	

Distribution by size of average annual change

Percent change (current dollars)	Number of companies
-50% to -20%	3
-20% to -10%	8
-10% to -2%	6
-2% to +2%	3
+2% to +25	4

Source: National Science Foundation, SRS

Mr. WALGREN. Thank you very much for both those presentations, and the chair would recognize Mr. Campbell for some thoughts and questions, and then we'll break to respond to this roll call and come back to conclude that discussion with this panel.

Mr. Campbell.

Mr. CAMPBELL. Thank you, Mr. Chairman. That is extremely courteous.

Just two questions quickly, one to Dr. Gorte.

You said the difference was the debt. Did you do any study or any follow-up as to how quickly these companies who retired their debt after an LBO might have re-established their R&D program?

Dr. GORTE. We haven't done any follow-on, no, and many of them happened really recently. So we have nothing formal.

I should ask if you want to saying anything.

Mr. CAMPBELL. Please, Dr. Miller, speak too, if you'd like.

Dr. ROBERT MILLER. Well, most of these were quite recent, and, as a consequence, there hasn't been a lot of down payment of debt as yet. What will be the consequence of that I really can't say.

Mr. CAMPBELL. I'll offer this one thought, and perhaps it will prompt a response. In those industries, you heard my opening comment that I'd read the KKR report. In the mergers—in the LBO's in which Kohlberg, Kravis and Roberts had been involved, they make a case that the retirement of debt happened quite quickly after the LBO and, as a result, they were able to bring their R&D back. So I was jumping on the point that Dr. Gorte made; if it is connected with debt, then it would certainly be meaningful, it seems to me, to study how quickly they come back after the debt has been retired.

If that doesn't prompt any further comment, I have one question to Mr. Stewart.

Please.

Dr. ROBERT MILLER. Just very quickly, KKR also in their report states that one of their primary objectives is really to avoid technology-intensive companies. So when they say that research and development has been maintained, as it probably has in their companies, I'm not sure it's terribly meaningful with respect to the totality of companies out there.

Mr. CAMPBELL. I think that's a fair comment, and they do admit that. Thank you.

Mr. Stewart, your analysis indicates a cutback in the number of employees, and you concede that that might be the elimination of overlapping employees in the R&D field. I'm wondering if you have any measure of the output on R&D. We have measurements of numbers of employees; we have measurements of R&D investment. Do we have any measure of output R&D in any meaningful sense as a percentage either of number of employees or of R&D expenditure?

Mr. STEWART. A simple answer is no, especially in terms of the R&D that takes place in industry. In the academic sector, we have been able to look at bibliometric data and try to get some indication of output there. In industry it's very difficult to assess any output from an input of funds into R&D. I'm sorry, sir, we do not have that information.

Mr. CAMPBELL. I appreciate your stating that. I think it's useful to realize the limits of our ability to study it, but that doesn't diminish the quality of your testimony in the slightest.

Mr. Chairman, thank you so much.

Mr. WALGREN. Thank you, Mr. Campbell.

At this point, let's suspend and respond to these bells on the Floor, and we'll resume in about 10 to 15 minutes. Thank you.

[Recess.]

Mr. WALGREN. Let me reconvene us and move us on.

I'd like to insert in the record at the appropriate point the opening statement of Congressman Costello, and, without objection, that will be the order.

This certainly seems like a difficult area to get a pure handle on, and yet both witnesses do seem to focus on negative effects of substantially increased debt in a situation. Is that an unfair—can you distinguish between mergers that are friendly mergers and mergers and leveraged buy-outs, on the other hand, that involve taking on a lot of new debt in the corporation? Is that sort of the general distinction that you make in changes in structure in this instance?

[Dr. Gorte nods.]

It's my understanding that corporate America as a whole has taken on substantially more debt in these last number of years than traditional, and I gather that's almost independent of the pure merger or the pure restructuring. Can you see any effects of that kind of general change, particularly if you look at technology-intensive companies? Any response you can give to that as a general trend, or do you think we really are seeing just the effects of mergers and leveraged buy-outs and that kind of activity?

Dr. ROBERT MILLER. I would like to respond partially to that. I don't know that I can respond specifically to your question about whether or not increased debt in the economy as a whole has had sort of parallel impacts on industry as a whole and particularly technology-intensive companies. I do think the problem is more systemic than would be indicated by the mergers and acquisitions phenomenon itself. That is to say, I think there's sort of a fundamental issue that financial markets really don't know how to handle research and development, and, as a consequence, putting pressure on managers indirectly affects, I think, the research and development activity in ways that are really quite deleterious, totally outside the mergers and acquisitions phenomenon itself.

Mr. WALGREN. And why is that? Why do the financial markets—is it just a short-term better return some place else in the immediate three months phenomenon?

Dr. ROBERT MILLER. I don't know. I think partly it's because research and development is, in some ways, so much of a sort of specialized activity in a company. It's an investment activity, but it's not like making an investment in capital equipment where pretty much you know what the capital equipment will do. You still have uncertainties involved because you don't know what the future sales are going to be and you don't know a lot of external parameters about the future. But research and development is much different because the outcomes themselves are uncertain, and I don't think financial markets know how to deal with that kind of phenomenon at all. It's my feeling; I don't have any great—

Mr. WALGREN. Yes, yes.

Any other responses on the general question? I apologize for being so general, but it's probably not wrongful. Go ahead.

Dr. GORTE. I think one of the other things that we need to bear in mind when we look at just particularly debt is, how the providers of capital behave is as important as the source. I've looked, to some extent, at Japanese—at the finance of Japanese companies and long-term investments, and there we see that they are taking on—you know, they are known for being heavily debt financed particularly, in the past; less so now they are taking on a whole lot more equity; and the question that is often asked is, okay, well, are they going to behave more like us? are they going to increasingly look at short-term focus? Well, so far there hasn't been any particular change. I mean we don't see a change in the focus of Japanese companies. There are many reasons for that, but one is that even the equity holders, those who are providing an increasing share of Japanese capital, are behaving very differently from American equity holders. This is an argument that we're developing, or a story that we're developing, in our assessment, so this is a little premature to state it as a conviction.

But what we are seeing—Japan invented in 1971 a thing called stable shareholding, which keeps most shares in Japan out of the hands of third parties; you sell most of your stock to someone who is a friend, another corporation, often a bank or a life insurance company, and they don't play with it, they hold it, and that's an agreement between the companies, and that was done specifically to keep foreign capital from taking over very many of Japan's corporations, and they still regard that as a very important thing that enables them to do as much R&D as they do, which is about twice as much as we do in terms of company-funded R&D as a percent of GNP.

Mr. WALGREN. Can you talk a little bit about the difference between debt and equity, just on a very basic level, for all of us who aren't economists?

Dr. GORTE. Rather than—do you want to try that one, Bob, or shall I tell you that I can provide this to you later? I'd rather not try to get into it all right—

Mr. WALGREN. Well, let me just ask this. Providers of capital also expect a return, as does a provider of a loan, I gather. Now what's the difference?

Dr. GORTE. In Japan, both the providers of equity capital land the holders of the debt have been very much more concerned about the viability of the enterprise as a long-term proposition, as a going enterprise, rather than, in one characterization of it from a Japanese source, as a bag of assets.

Mr. WALGREN. So one difference is that the provider of the capital is actually interested in what you do with it, whereas the provider of the loan is providing the dollars.

Dr. GORTE. In Japan, it seems that anybody who provides capital to you, including most of your equity holders and most of your debt holders, are very interested in the long-term performance of the company, much more so than in the United States.

Mr. WALGREN. Okay.

Let me ask Mr. Stewart, this flattening of the investment in research and development that you see in these several years after a substantial period of growth, does it make sense to perhaps be more concerned about what the overall investment on an economy-wide basis is in research and development rather than whether one sector has gone flat in any period of time?

Mr. STEWART. Mr. Chairman, in this case we are talking about industry, and industry is such a major player, I think you have to be concerned for the Nation with what happens in industrial R&D. They provide—industry, itself, provides half of the funds that we spend on R&D, and to the extent that decreases in R&D funds represent an actual decrease in R&D effort and not just greater efficiencies, I think there is cause for concern.

What we are faced with now is a situation in which we have mixed information; some companies are telling us that indeed they are achieving greater efficiencies after the restructuring; other companies are giving us stories that indicate that there is a real cutback. Until we have additional data, we really aren't going to be able to establish which is the more—

Mr. WALGREN. Yes.

Is there any way to evaluate whether or not they are getting greater efficiencies? because it seems human nature, if you ask somebody who has overseen a cutback and, you know, done some damage to people and the careers of people that he was associated—he or she was associated with, and they, on the one hand, will say, "Well, gee, we suffered a lot of damage." On the other hand, they have to feel that there is some good that comes out of their own action, and therefore they would say, "But, of course, we are more efficient." What kind of measures can you use of efficiency of research and development?

Mr. STEWART. Again, you have to look at the question of output, for which we have very little ability to assess. What we do is look at indirect indicators, the relationship between employment of scientists and engineers to total employment, the relationship of R&D to sales, and I think that when we have additional data—data for additional years; I should be more specific—it will be a better indicator of whether, indeed, the restructuring was a temporary phenomenon and, for that matter, whether it's achievement of greater efficiencies or as a result of a lack of funds and they're now able to do more research. We would be better able to assess that.

Mr. WALGREN. Yes.

Is it your view, as somebody who wants to make a studied conclusion, or come to a studied conclusion of this phenomenon, that it is going to take a period of five to 10 years to look back on this event, or these events, to come to what you would call a rational, studied conclusion, as opposed to somebody using their common sense to say, "Look, this looks harmful to the overall enterprise"? How long would you need before you feel you could come to rational retrospective conclusions?

Dr. GORTE. You can't say, you know, a number of years, but I think that probably your estimate of four or five years or something like that probably would give you a better basis for rational decision-making than trying to decide.

Now this metaphor is not absolutely apt for many reasons, but you can think of R&D as a kind of pipeline, and they're stuck in that pipeline that—it's coming on line now that you're able to use, and if you cut back what is being put in the pipeline at the other end, you can still have stuff coming out and it looks very efficient in the short run. If you don't replenish that pipeline at some point, it's going to hurt you, but it probably isn't going to be seen right away.

Mr. WALGREN. I see.

Mr. STEWART. I would agree with that. It's difficult to give a precise time, but I would think five years would be a minimum time period. There are a lot of reasons for that. I think the nature of the—the characteristics of the firms involved in restructurings during these last few years differ considerably from those that took place in the sixties when there was a rash of restructurings.

For one thing, I believe that the more recent ones are on a horizontal plane, where you have companies within the same industrial SIC category that are merging; therefore, you are seeing an overlap of R&D activity, and indeed that may be a major explanation of why there is a cutback, because with the overlap they're thinning out the duplication. Whereas in the sixties we had a more vertical set of mergers, with companies in different industries, and therefore there was no reason to see an overlap and no reason for duplication. I think, indeed, it will take probably another four or five years before we see a sufficient pattern following these large companies that we can begin to draw some real conclusions.

Mr. WALGREN. Okay.

Mr. ROBERT MILLER. Could I comment very briefly?

Mr. WALGREN. Yes, sir.

Dr. ROBERT MILLER. Two things. One is this matter of efficiency of research and development. It seems to me that if a company cuts back in its research and development activity, the first thing it is going to cut back are those things that are least likely to lead to some positive outcome, which would imply that the stuff that's left over is going to be more efficient than what the whole was to start with. So it is almost a self-fulfilling kind of thing that when you cut back you are going to be more efficient than you were. At some point, you reach a critical mass, of course, in which that may not be true, but—

Mr. WALGREN. Yes, but to a certain degree you cut back the more basic research or the more exploratory research.

Dr. ROBERT MILLER. Typically that is what happens.

Mr. WALGREN. And we feel there's a value in that.

Dr. ROBERT MILLER. The other thing I would just comment very briefly on is this matter of, quite a lot of companies when they—particularly horizontally oriented companies, when they merge, will eliminate the research and development on one side or the other because it is duplicative, as Mr. Stewart said.

There's something to be said for duplication, however. Competing research and development laboratories, for example, and the elimination of competition in that sense may not necessarily be favorable.

Mr. WALGREN. Yes. Point well taken.

The gentleman from New York, Mr. Boehlert.

Mr. BOEHLERT. Mr. Chairman, first of all, I have a—

Mr. WALGREN. Without objection.

Mr. BOEHLERT. All right, fine—my usual erudite statement, but I won't—I'll spare you that reading. Thank you very much. For the record.

[The prepared opening statement of Mr. Boehlert follows:]

HON. SHERWOOD BOEHLERT (R-NY)

OPENING STATEMENT ON MERGERS AND CORPORATE RESEARCH

July 13, 1989

MR. CHAIRMAN:

The poet Marianne Moore once wrote, "Psychology, which explains everything, explains nothing, and *we are still in doubt.*" *After* reading this morning's testimony, I am tempted to offer the same lament about economics.

We will hear that statistics demonstrate that mergers and LBOs are having, might be having, and are not having an adverse impact on corporate research. We will then hear that the smae range of conclusions can be drawn from personal experience.

This Committee could hardly present a better example to make its case for increased funding of the social sciences. We clearly need more data even to pretend to definitive findings.

Such data are vital if we are to come up with an intelligent technology policy. The studies we will review today have implications beyond determining the proper federal posture towards mergers and corporate debt.

For example, we are often told that American corporations need to be allowed to pool their resources to compete against the Japanese combines. But is this true if corporate marriages result in cuts in R&D?

We hear a lot of complaints -- legitimately -- about the cost of capital in the U.S. The high cost is presented as one reason firms don't invest more in research and its results. But is this true if these same firms can borrow millions for buyouts and acquisitions?

Many of our witnesses today speak approvingly of spending cuts that merely eliminate duplicative research. But didn't we once view such duplication as the healthy competition that gave life to the nation's research enterprise? Today we seem to tout competition as the way to improve every troubled aspect of our society -- schools, public housing -- every aspect, that is, except business.

This Committee has expended much energy to push federal labs to work more with industry. What ramifications do changes in corporate

R&D have for that policy?

These are not rhetorical questions. Their answers are not known, and will not be known until we have more complete informatio

The one point on which there is no disagreement is that research and development is the key to our future prosperity. Government policy must encourage the private sector to make use of that key.

This hearing is just a first step toward that goal. The transcript may very well end up reading like a post-modern version of "Chicken Little." Many characters are running around saying, "The sky might be falling; the sky might be falling." A stable of economists is skeptical. And we haven't figured out how the story ends yet. Thank you.

Mr. BOEHLERT. Dr. Gorte, how were the companies for the OTA's survey selected, and are they representative? Is it a representative sample?

Dr. GORTE. No, this isn't a representative sample, these companies were selected—we were looking for manufacturing companies, and we were looking specifically for those that had undergone a takeover or some kind of merger or acquisition activity that involved high debt.

Mr. BOEHLERT. Okay. Thank you.

Mr. Stewart, can you tell us some more to explain the plateau in R&D spending in the computer industry? It's an area that is particularly of interest to me.

Mr. STEWART. I'm sorry, in the computer industry?

Mr. BOEHLERT. Yes, the plateau in spending.

Mr. STEWART. With the chairman's permission, I would like to turn to my colleague, Melissa Pollak, to respond to that in detail.

Mr. BOEHLERT. Ms. Pollak.

Ms. POLLAK. Can you hear me?

Mr. BOEHLERT. Sure.

Ms. POLLAK. Okay. You're asking about the plateau in the computer industry during the mid-eighties? It's difficult for me to talk specifically about that industry. I'll say that it's an industry that is dominated by a small number of very large R&D performing companies, and any time one of, or a couple of, those large R&D performing companies have a cutback in R&D spending, it will cause that industry to be flat, and that's probably about as specific as I can get about that industry.

I will say, though, that there was at least one of those companies that was included in the study, and it was responsible—it had a dampening effect on the R&D performance, on the growth of R&D spending in the computer industry during that period.

Mr. BOEHLERT. Let me ask you, Dr. Gorte, I guess, did mergers with foreign firms seem to have different results than mergers between domestic firms?

Dr. GORTE. Correct me if I'm wrong, Bob. I think there was only one case that we—only one that we looked at where the acquirer was a foreign parent, and this was a friendly merger, and in that case the company's R&D expenditures increased. The company that was acquired was acquired because it had strong R&D—partly because it had strong R&D.

Mr. BOEHLERT. And the spending was further increased?

Dr. GORTE. And the spending was further increased, that's correct, and, in fact, the parent—the new parent, which was German, was—at least some people in the acquired company viewed the new parent as being more willing to support long-term research and development.

Mr. BOEHLERT. But you just did one?

Dr. GORTE. Just one.

Mr. BOEHLERT. Okay.

Thank you very much, Mr. Chairman.

Mr. WALGREN. Thank you, Mr. Boehlert.

Well, let me, on behalf of the committee, express our appreciation to both of you for the work that you are doing and your being available to our discussion process as a resource to us, and we'll

look forward to interacting with you on this subject in the future. Thanks very much.

I'd like to call the next panel: Bronwyn Hall, the assistant professor of economics at the University of California, Berkeley; Mr. William Long, a guest scholar at the Brookings Institute; and Dr. Frank Lichtenberg, an associate professor of business at Columbia University.

Folks, if you'll come and join us, we'll look forward to your testimony. As I said previously, your written statements will be reproduced in the record without further, and you can feel free to diverge in any way that you feel would make a good point and contribute to focusing attention on the more important factors.

Let's go through your testimony in the order in which I introduced you to the record, and we'll start with Ms. Hall.

STATEMENTS OF BRONWYN HALL, ASSISTANT PROFESSOR OF ECONOMICS, UNIVERSITY OF CALIFORNIA, BERKELEY, DEPARTMENT OF ECONOMICS, BERKELEY, CALIFORNIA; WILLIAM LONG, GUEST SCHOLAR, BROOKINGS INSTITUTION, WASHINGTON, D.C.; AND FRANK LICHTENBERG, ASSOCIATE PROFESSOR OF BUSINESS, COLUMBIA UNIVERSITY, NEW YORK, NEW YORK

Ms. HALL. Thank you, Mr. Chairman, and thank you for inviting me to talk today about my research on research and development.

As the Congressman mentioned, I am an assistant professor of economics at the University of California, Berkeley, and I've been studying the economics of research and development investment in the U.S. manufacturing sector for several years, and I'm currently engaged in a new study of changes in corporate capital structure and R&D investment at the firm level, which is intended to update and extend an earlier study of mine on the effects of takeover activity on research and development.

Now this study was published last year in a National Bureau of Economic Research Conference volume, and anybody who is interested in the details of the study is welcome to ask me for a copy.

My remarks today are going to summarize what I and other economists have learned in our recent work on this subject. What I'm planning to do is to go fairly quickly through my written remarks and possibly respond to some of the questions that were raised earlier at the end.

Now the question that is posed in the charter for this hearing is whether corporate capital restructuring in general and leveraged buy-outs in particular have a negative impact on the amount and direction of corporate R&D effort. This question has two pieces. Neither I nor the other economists whose work I have examined really have a whole lot to say on the second part of the question, which is the direction of corporate R&D: Is it directed more toward short-term projects rather than long-term projects in response to recent increases in financial activity?

On balance, I think the evidence to date on the first question, which is the level of R&D, can be summed up by the verdict, not guilty, although some people—you know, more cautious people might describe it as not proven rather than not guilty.

The two findings I want to highlight today, the first one is that in my original study I found that between 1976 and 1985 the R&D intensity of publicly traded manufacturing firms which participated in a merger or acquisition rose by a small amount in the two or three years following the acquisition.

Now I measured research and development intensity in a way which is more or less standard in the economics literature. It is the ratio of the total expenditures a firm makes on research and development divided by the sales during the same year. The advantage of that technique is that it puts different firms in different years on a common footing. You are making some attempt to control for the fact that firms differ in size, and you are also making an attempt to control for the fact that the price level is rising.

Now in my original study of 1988 I reported this result, that the R&D intensity of publicly-traded manufacturing firms rose slightly; I also reported that the R&D intensity of firms not involved in acquisitions also rose slightly by the same amount, the average R&D intensity. In other words, they didn't look any different; it wasn't that they were doing more research and development, it was just that the firms looked pretty much the same.

I recently, very recently, partly in response to the charter of this hearing, went back and, in response to the National Science Foundation study, went back and looked at the numbers for 1986 and 1987, and the answer there is that, again, I find the same result. For the approximately 250 manufacturing sector acquisitions between '77 and '86, the average post-acquisition R&D intensity rose from 1.6 percent to 1.8 percent in the two years around the acquisition. This increase persisted into the second year after the acquisition—in other words, I now was looking over a three-year period—and it's the same as the average two- or three-year increase in R&D intensity for all firms in manufacturing.

Now I believe that the difference between my results and the National Science Foundation results are not due to the fact that I'm examining more acquisitions and they're not due to the fact that their period may be now—may be one year later than mine; it's not clear. I think the primary reason is because I'm focused on research and development intensity because I really believe that the size—one really does have to do something about the fact that the firm may be bigger or smaller and that their numbers, the numbers they presented, have been—they are interested in the total level of research and development in the country, and so their numbers have been in the total level—have been in the level.

I think both sets of numbers are interesting myself, so I'm just calling your attention to where I think the discrepancy is coming from.

Now the second finding I can report on is, this is now specifically the leveraged buy-out question. Unlike some testimony which you will hear later in this panel given by Professor Lichtenberg, I can't examine the research and development performance of firms after they have gone private because I'm dealing with publicly available data. However, I can report two suggestive facts.

First, Professor Steven Kaplan of the University of Chicago Graduate School of Business has studied 76 leveraged buy-outs in the last five years, and he finds that only seven of those firms in-

volved in the buy-out report doing any research and development at all before the acquisition.

In addition to my sample of 300 acquisitions of public firms, I also have other acquisitions, and I studied 30 of those which I could identify as leveraged buy-outs, and I found they had very low R&D intensity before acquisition. During the three years, '84, '85, and '86, when most of this took place, the total amount of research and development performed by these firms in the year prior to going private was $54 million. The 1985 corporate R&D paid for by industrial corporations was $52 billion.

In other words, all of the leveraged buy-out spending on R&D could just disappear and you wouldn't notice it, and so I think the Kohlberg, Kravis and Roberts statement, which is that leveraged buy-outs are generally not appropriate for high-technology businesses, I think that statement reflects the leveraged buy-out business in general; you don't look for firms that have the character that they need research and development to survive when you want to do a leveraged buy-out.

So my conclusion from this is that capital restructuring, per se, is not a threat to the industrial R&D process. In fact, it may be a contributor to more rapid technological change by hastening downsizing and elimination of firms which have fallen behind technologically.

However, I still have this sort of uneasy feeling that the uncertain financial environment in which we find ourselves, in which mergers and acquisitions and leveraged buy-outs are a symptom, if you like, may have a discouraging effect in general on long-term investment projects. It's simply that I don't think the way to fix it is to monkey with the merger and acquisition process.

I would point more directly to high real interest rates, which do cause a shift to a short-term—shorter-term focus, and the other thing, I think, which is, I think, fairly clear here is that debt may indeed be a problem. I think the financing issue, that's already been raised, the fact that research and development is not something which is easy to get a bank loan on, and yet we have a situation in which the tax treatment of debt and the tax treatment of equity for U.S. corporations is very different.

As I'm sure you've had other economists tell you in other venues in this building, interest expense is deductible to the corporations and dividends are not. The payments you make to equity holders are not deductible, the payments you make to bond holders are, and if debt is not an appropriate financing source for research and development investment, the implication of that is that research and development investment is going to be harder to finance than other things because it costs you more; you have to issue equity or use your own internal funds. So that's the area where I think people who are interested in increasing research and development investment ought to be looking.

Now I'm going to finish up with one further comment, which is about this business of research and development and the stock market. I have, in fact, done a fair amount of research trying to ask the question, does the market value research and development? To first order, it clearly does, it values it just like other kinds of investment. There is not evidence that when companies spend

money on research and development the market is not treating that as a valuable asset. It seems to me valued at about the same—the same rate, and again—I mean people who are interested in that, I can give them citations.

So I'll close my remarks there.

[The prepared statement of Ms. Hall follows:]

Testimony of Bronwyn H. Hall in hearings on "Corporate Restructuring and its Effects on R&D" before the Science, Research, and Technology Subcommittee of the House Committee on Science, Space, and Technology, July 13, 1989.

My name is Bronwyn Hall and I am an Assistant Professor of Economics at the University of California in Berkeley. I have been studying the economics of Research and Development investment in U.S. industry for several years and I am currently engaged in a study of changes in corporate capital structure and R&D investment at the firm level; this study updates and extends an earlier study of mine on the effects of takeover activity on R&D, which was published last year in a National Bureau of Economic Research conference volume by the University of Chicago Press.* My remarks today summarize what I and other economists have learned in our recent work on this subject, which is the central topic of this hearing.

The question of concern to this subcommittee is whether corporate capital restructuring in general and LBOS in particular have a negative impact on the amount and direction of the U.S. corporate R&D effort. This question has two parts; unfortunately, neither I nor the other economists whose work I have examined have much to say on the second. That is, we have been somewhat successful in examining the level of R&D expenditure,. but as of yet we have not much to say about whether R&D has shifted in the direction of shorter term projects. On balance, I think the evidence to date on the first question can be summed up by the verdict "Not Guilty", although a more cautious observer might describe it as "Not Proven". My findings and those of others are the following:

*Auerbach, Alan (editor). 1988. Corporate Takeovers: Causes and Consequences. Chicago, Illinois: University of Chicago Press.

1.) In general, the R&D intensity of publicly traded manufacturing firms which have participated in a merger or acquisition rises by a small amount in the two or three years following the acquisition. I have measured R&D intensity in a way which is more or less standard in the economics literature: it is the ratio of the total expenditures on research and development by the firm during the year to their sales during the same year. This has the advantage of putting different firms and different years on a common footing, since it controls both for the size of the firm and for the nominal price level (R&D and sales are both measured in current dollars). In my original study of 1988, this result was reported only through 1985, but data through 1987 also show the same result. For approximately 250 manufacturing sector acquisitions between 1977 and 1986, the average post-acquisition R&D intensity rose from 1.6% to 1.8% in the two years around the acquisition; this increase persisted into the second year after the acquisition and is the same as the average two year increase in R&D intensity for all manufacturing firms during this period.

The distribution of changes in R&D intensity for the acquisition sample is very similar to that for the manufacturing sector as a whole (a sample comprising over a thousand firms). These distributions are shown for comparison in the attached figures, first for all firms, including those which do no R&D in the period before or after the acquisition, and then just for those firms which perform R&D during the whole period. The conclusions from either picture are the same: there is a hint that a few firms (less than ten) might have experienced a larger than expected cut in R&D expenditures, but by and large, the firms involved in acquisitions experienced much the same kinds of

changes in their R&D as those firms which were not involved.

My conclusion from these results and other similar findings is that manufacturing sector firms involved in manufacturing sector acquisitions, whether buying or selling, behave very much like other firms in the sector with respect to R&D behavior; there is little sign even of cuts in R&D which might be attributed to consolidation of laboratories or elimination of duplicative efforts after merger. In independent work using R&D employment, Lichtenberg and Siegel have confirmed this result.

2.) What about LBOs? Unlike Professor Lichtenberg, I cannot examine the R&D performance of firms after they have gone private since I am using publicly available data. However, I can report two suggestive facts: first, Professor Stephen Kaplan of the University of Chicago Graduate School of Business has studied 76 LBOs in the recent past, and finds that only 7 of the firms report doing any R&D at all before the acquisition.

Second, in addition to my sample of 300 manufacturing acquisitions by publicly traded firms, I have some 200 or so manufacturing sector acquisitions by private or closely held firms, 30 of which are LBOs. Both of these groups have low R&D intensity before acquisition: an R&D to sales ratio of 0.6 percent for the privately acquired firms, and 0.4 percent for the leveraged buyouts. During the three years 1984, 1985, and 1986, when most of the LBOs in my sample took place, the total amount of R&D which was performed by these firms in the year prior to going private was $54.4 million dollars. This is to be compared with the total private sector industrial R&D spending in 1985, which was 52.4 billion dollars. Even if all this R&D spending disappeared after going

private, this would make a very small dent in overall industrial R&D.

Taken together with Kaplan's results, these facts suggest that firms in which research and development are important are not LBO candidates; this is confirmed by examination of the industries where these buyouts occured: half of them were in food and textiles and the remainder were distributed among lumber and wood, fabricated metals, rubber, and stone, clay, and glass. As Kohlberg, Kravis, and Roberts have said, "leveraged buyouts are generally not appropriate for high technology businesses."

All these facts lead me to conclude that capital restructuring per se is not a threat to the industrial R&D process; in fact, it may be a contributor to more rapid technological change by hastening the downsizing and elimination of backwards firms. I certainly do not think government intervention in LBOs is required to prevent them from eroding our R&D base.

However, I still have the uneasy feeling that the uncertain financial environment of which these activities are a part does have a discouraging effect on long term investment projects, simply because this environment is associated with high real interest rates. It is just that I don't think the incentives for investment in innovation can be improved by attacking LBOs and mergers. The solutions are more likely to lie in the realm of macroeconomists.

from Bronwyn H. Hall, "The Effect of Takeover Activity on Corporate Research and Development," in Alan Auerbach (ed.), Corporate Takeovers: Causes and Consequences, University of Chicago Press, 1988.

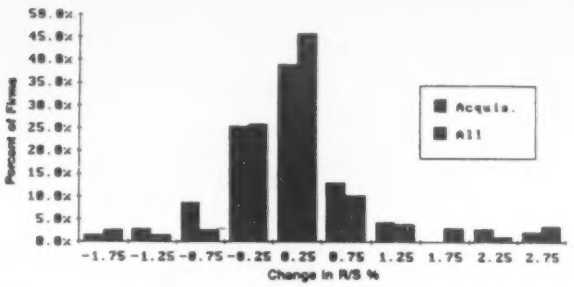


Fig. 3.1 Two-year change in R&D intensity at acquiring and nonacquiring firms in manufacturing, 1976–86

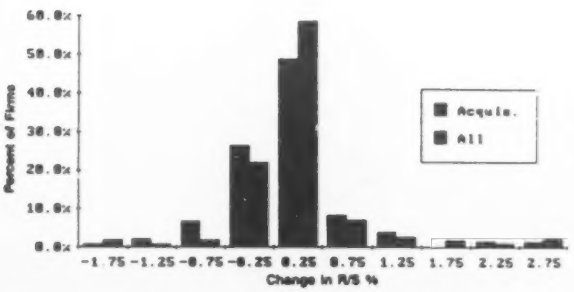


Fig. 3.2 Two-year change in R&D intensity, with data including firms not engaging in R&D, 1976–86

in only two of the four nonparametric tests. The same conclusion holds looking at three-year changes around the time of acquisition (not reported here). The conclusion is that there is no overwhelming evidence that acquiring firms experience a change in R&D behavior around the time of acquisition.

Because firm size is systematically related to both R&D intensity and the probability of being acquired, the data in the preceding tables

Mr. WALGREN. Thank you.

Just while I have the thought, the stock market value of R&D, the stock market's recognition of it, that is—do you differentiate between that and a venture capitalist's valuation of R&D?

I have this impression that the actual value of the stock, it's after the company has received the equity for the sale of the stock, it really isn't contributing directly to the internal appreciation of the company, except perhaps in a shareholder satisfaction sense, and so my point is, is it significant that venture capitalists might really value R&D, or perhaps not be able to value R&D, compared to the stock market saying, "Well, we appreciate it, and we see the stock price on a publicly traded issue support it"?

Ms. HALL. Yes. Let me make a real big distinction here. The firms that I'm talking about, whose research and development is valued by the stock market, which I have studied, are in primarily those 200 that make up the 90 percent of industrial R&D, okay? So we're talking firms where the stock market believes that these firms know how to perform research and development—IBM.

The other side of the coin is really a whole set of different problems which are, suppose there is a person with a good idea who needs money to finance his research and development; that's where the venture capitalists work. I haven't studied that. My impression is that—from the readings I've done, is that that indeed may work somewhat better in this country than in other countries.

Mr. WALGREN. Yes. You would think they would be able to appreciate that.

Ms. HALL. Yes.

Mr. WALGREN. Okay. Well, I apologize for interrupting you.

Let me turn to Mr. Long and then Dr. Lichtenberg.

Mr. Long.

Mr. LONG. Thank you, Mr. Chairman.

I am a guest scholar at Brookings Institution currently, beginning work on a project to look at the determinants of performance in several dimensions for leveraged buy-outs and other restructured firms.

One aspect of performance that I and my two colleagues intend to look at in some depth is research and development performance. For 17 years until the end of last year, I was an economist at the Federal Trade Commission, and for 12 of those years I managed the Line of Business Program, collecting data by line of business from large firms, including data on R&D by line of business. Those data have been used in roughly a dozen or so academic studies done by five or six different research economists and published in a variety of places. That's one of only two sources of data for research and development by business unit or by line of business, the other being a private source.

Our interest in our study is to look at the impact of leveraged buy-outs and other kinds of restructuring across a very large sample, one we hope to be the universe of leveraged buy-out firms.

In focusing on the question at hand today, I went back to take a more focused look at the question of impact on R&D performance and pulled together as many studies as I was aware of at the time that raised the question of the impact of restructuring in general—call it mergers and acquisitions—or leveraged buy-outs in particu-

lar on R&D. I've put those studies together in a table that has three parts. Unfortunately, I didn't get part 3, which is the citations, included in the distribution that was handed out, but it is available.

Part A is basically a summary of the findings of nine different studies on either the impact of mergers and acquisitions or the impact of leveraged buy-outs on R&D performance. Part B is a summary of some of the major procedures that were used in those studies, and Part C is the citations. The other two panelists are cited heavily. There's no citation for me because I haven't actually performed one of these studies yet, though that's my intention, and the KKR study, which was referenced earlier a couple of times, is also included in that list.

The bottom line is, people say, the next to last column of Panel A. Those are the findings of nine different studies of the impact of restructuring or of leveraged buy-outs on R&D performance. The NSF study is in this list as well.

Clearly, the average finding, the typical finding, in the next to last column is that there's no effect of mergers and acquisitions generally or of leveraged buy-outs in particular on R&D performance.

I do note that two of the studies, the NSF study that has been mentioned and the KKR study, look at R&D in the aggregate by company. I agree with the other two panelists here that R&D to sales is a better measure of R&D performance, though there are certainly applications where R&D, per se, is the variable that ought to be used, because if we're looking at the aggregate output of R&D activities for the economy as a whole and trying to compare that to other industrial economies we'd probably want to do that. So the question of whether to use R&D to sales or R&D directly is a question of the application.

A variety of methods have been used in these studies to reach conclusions about the impact of restructuring or the impact of leveraged buy-outs on R&D performance. Those I've tried to characterize in Panel 2, and I used a characterization which is my own; it is shared by a couple of colleagues who are involved in putting together our own R&D study. The methodologies that I focus on in this Panel 2 come out of a paper that one of my colleagues, David Ravenscraft, and I recently put together which focused on—focused specifically on the methodologies used in a number of extant studies on the impact of leveraged buy-outs generally, including the KKR study.

Let me just focus on these one by one. Industry adjustment is a severe methodological question in looking at the performance of companies, whether it's R&D performance or some other kind of performance, because industry circumstances vary a lot. For instance, in the R&D business there are some industries where R&D is just typically not done. So looking at R&D performance of companies in those industries would not reveal very much about how the R&D business works.

Our belief is that some adjustments for what is happening in the rest of the industry ought to be made in a study like this, and I note that the incidence of industry adjustments to take into account what is happening among other firms in the industry is

about 50/50; about half of these studies have used an industry adjustment and about half haven't. We would say that the ones that didn't should have. So we would apply that to NSF and to a study by Merrill Lynch, and to Frank and Don Siegel's recent study, and to Bronwyn's study, and to the KKR study. So that would be our position on that, and we intend to do so ourselves.

On the handling of acquisitions and divestitures, the next two columns, there's been a less even-handed approach. In some cases, acquisitions are handled, by definition, because the study's whole focus was on all acquisitions that could be found, and so that's not a problem. In some other cases, the handling of acquisitions is a serious problem because data are tabulated as if no acquisitions took place when, in fact, they did.

The KKR study is a case in point there. You have to be very careful about reading the results of that study because, for instance, one of their major companies, Owens-Illinois, acquired shortly after the buy-out another large company, Brockway, and then cited the fact that their R&D had gone up, and that's comparing apples and oranges or more maybe apples and orange crates. You've got to be very careful. That's one of the advantages of using R&D to sales and looking at the change, at the impact of some phenomenon on R&D performance.

So handling of acquisitions is particularly important in a study that looks at the aggregate level of R&D expenditures. Divestitures is another serious problem. It's been such a serious problem in studies of leveraged buy-outs that most researchers have thrown observations out if there have been significant divestitures because it has been considered too difficult to handle.

The one significant exception there is the study by KK&R. They went back and pulled the data on the divestitures out from both the pre-buy-out period and the post-buy-out period, and that is certainly a preferable thing to do for divestitures rather than throwing observations out.

On inflation adjustment, the story is mixed there, once again depending on whether the study focuses on aggregate R&D or on R&D to sales ratios. If prices have been changing at about the same rate for both R&D inputs and for the output of the company, then not making inflation adjustments is of no great consequence because you'll be dividing by the same adjustment factor that's in the top half of the ratio.

On the other hand, once again, if you are looking at absolutes, as KKR does and as NSF does, it is critical to adjust for inflation, and NSF did, and KKR didn't.

One other final point on procedures, and then I'll stop, is that most students have left the LBO or the merger and acquisition year out of the data that are used in examining the before/after picture for the very simple reason that the data for that particular year are considered to be extremely volatile because of accounting and reporting conventions and because of the revaluation of assets and the revaluation of income and the whole bag.

Well, let me stop on that and wait for questions.

[The prepared statement of Mr. Long follows:]

Statement of William F. Long*

Subcommittee on Science, Research and Technology

Committee on Science, Space,
and Technology

House of Representatives

JULY 13, 1989

*Guest Scholar, Brookings Institution. The views expressed herein are my own, and do not necessarily reflect those of the Brookings Institution.

Table A. Studies of Impacts of LBOs and Other Restructurings on R&D

Panel 1 - Results

Author	Vari-ble	No. Obs.	Data Years	Test Years	Indep. Var.	Sign	Signif. Test
Hall	R&D/S	314	77-86	-1/+1	m&a	0	yes
HHI&H	R&D/S	191	70-86	-2/+2	m&a	-	yes
KKR	R&D	10	79-85	-2/+2	lbo	+	no
L&S 1	R&D Emp Gr	1099	77-82	-2/+3	m&a	0	yes
L&S 2	R&D/S	43	81-86	*	lbo	0	no
ML	R&D/S	6	84-86	-1/+1	lbo	0	no
NSF	R&D	8	84-86	86/87	lbo+	-	no
R&S	R&D/S	2955	77	*	m&a	0/-	yes
Smith	R&D/S	7	77-86	-1/+1	lbo	0	yes

* Not applicable.

Table A. Studies of Impacts of LBOs and Other Restructurings on R&D

Panel 2 - Methods

Author	Ind. Adj.	Acquis. Handled	Divest. Handled	Inflat. Adj.	LBO/M&A Yr. Excl.	
Hall	no	yes	no	yes	yes	all acquis, pub. cos.
HHI&H	yes	no	no	no	yes	all merging cos. reporting R&D
KKR	no	no	yes	no	no	all LBOs done by KKR, & still owned
L&S 1	yes	no	no	*	no	auxiliary estab. reporting both years
L&S 2	no	no	no	no	no	all major LBOs, whole co., R&D reporters
ML	no	no	no	no	yes	large public buyouts, R&D reporters
NSF	no	no	no	yes	no	LBO & other restruct., 200 largest R&D performers
R&S	yes	yes	yes	*	*	FTC lines of business, large cos.
Smith	yes	no	yes	no	yes	MBOs, public data (49), private (9)

* Not applicable.

The Record of LBO Performance

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I. Introduction

As the number and size of leveraged buyouts increased over the last decade, so did the amount of research into LBO phenomena. Most of this research focused on the pre-buyout characteristics of the LBO firm and its industry, or the impact of LBOs on the pre-buyout shareholders and bondholders. Because of the nature of going private transactions, only a few studies attempted to assess the post-buyout performance of LBO firms.

The most recent entry into the post-buyout research field is a paper released by Kohlberg Kravis Roberts & Co. (KKR), entitled, "Presentation on Leveraged Buy-outs." The paper was based largely on an empirical study of 17 LBOs performed by KKR in which it still had an equity stake as of January, 1989.[1] On May 25, 1989, at a hearing before the House Subcommittee on Telecommunications and Finance, Emil M. Sunley of Deloitte Haskins & Sells presented some retabulations of the data used in the KKR study. For our analysis of those retabulations, see Appendix A.

This paper reviews the main KKR findings and compares these findings to other analyses of post-buyout performance.[2] These other studies include two papers presented at last year's Salomon Brothers Center conference on management buyouts by Kaplan (1989) and Bull (1989), a study of LBOs that return to the public sector via initial public offerings (IPOs) by Muscarella and Vetsuypens (1989), a study of largely publicly reporting LBOs by Smith (1989), and a National Science Foundation study (1989) analyzing the impact of restructurings on R&D expenditures. The KKR study stands out from the others in some very important ways. It discloses the identities of the companies in the sample and it provides year-by-year aggregate data for the seven year company histories. Without those disclosures, we could not have conducted the extensive review reported below.

We conclude that some of the KKR findings, particularly in regard to employment, capital spending, and R&D, are inconsistent with other work. At least part of this difference can be traced to methodological problems in the KKR paper. Furthermore, we conclude that weaknesses in the methods used in <u>all</u> the current research, together with a number of still unanswered questions, suggest the need for further research. We summarize a proposal we have developed for pursuing this additional research.

II. Comparison of KKR Findings with Other Post-LBO Results

Table I contains a convenient comparison of the numerical findings from the six studies that have investigated post-LBO performance.[3] Two observations are evident from this Table. First, the size of KKR's sample is in line with the small samples used in other studies. Second, the KKR findings often contradict the results of other work. The KKR study finds increases in employment, R&D and capital expenditures, whereas the other studies find no change or a decrease in these variables. This section explores these differences by presenting each of the KKR study's seven major findings (p. 2-1) and comparing them to results of the other studies. The last subsection discusses two key variables contained in other studies, but omitted from the KKR analysis.

A. LBOs increase employment.

Average annual employment for the 17 KKR companies after the buyout was 13% higher than average annual employment before the buyout.[4] Kaplan (1988), Smith (1989) and Muscarella and Vetsuypens (M&V) (1989) also analyzed employment effects of LBOs. None of these studies confirms this employment growth. Kaplan found almost no change in employment, M&V found a slight decline in employment, and Smith found a sharp decline in employment, but no change in employment divided by sales. Kaplan further demonstrates that employment was increasing in the LBOs' industries. If the LBO firm's employment growth is compared to that of its industry, relative employment declines by 15.3%. Therefore, to accurately assess the change in employment, the KKR and M&V studies should have controlled for industry growth.[5] Based on Kaplan's study, industry controls would probably substantially reduce the employment growth numbers for the KKR and M&V studies.

B. LBOs increase research and development expenditures.

According to the KKR study, post-LBO R&D expenditures were 15% higher than pre-LBO expenditures for the 17 KKR companies combined. In a recent response to a request from Congress, the National Science Foundation (NSF) (1989) presents conflicting data. While the NSF study did not compare R&D expenditures before and after the LBO, it did demonstrate that R&D declined between 1986 and 1987 by 12.8% for the 8 out of 200 leading U.S. R&D performing companies which had undergone LBO, buy-back, or other non-merger restructuring. Not all of the 8 firms are

LBOs,[6] but, according to NSF's response, "each of these firms had a significant reduction in R&D spending." The 176 firms that were not involved in mergers, LBOs or other restructurings increased their R&D by 5.4%. The NSF study adjusted for inflation whereas the KKR study did not. Neither study controlled for changes in industry R&D.

Smith provides conflicting evidence. She finds significant declines in R&D/sales for the 7 firms with available data. However, she cautions that "the generalization of these results is highly questionable because of the likely immateriality of R&D expenditures of nondisclosers" (page 39).

C. LBOs yield higher taxes to the federal government.

KKR, Kaplan, Bull and Smith all confirm that the taxes paid by the LBO firm are virtually eliminated after the buyout. Kaplan concludes that "Potential tax benefits generated by the buyouts are large, ranging from 31% to 135% of the premium paid to pre-buyout shareholders." (Kaplan (1989), p. 21) While taxes clearly play a role in explaining LBO premiums, the large potential range (31-135%) of this role indicates the complexity in accurately assessing tax effects. LBOs also create wealth for shareholders, LBO investors and bondholders (at least in terms of interest received), and taxes paid on this wealth result in increased government revenue. KKR shows that the capital gains tax paid by shareholders and investors and interest income tax paid by debt holders more than compensate for the tax reductions that the LBO firm receives. The net result was an increase in taxes paid of $2.9 billion dollars. This finding requires assumptions concerning: (1) the distribution of shareholders and bondholders among individuals, banks, corporations and tax exempt organizations at the time of the LBO, (2) the average basis of stock purchased by LBO shareholders, (3) the relevant marginal rates of each group, and (4) the absence of transfers from bondholders, employees, suppliers and communities to shareholders, since these losses would offset shareholder gains.

D. LBOs keep capital spending strong.

The KKR study finds that capital spending increases from an average of $1,054 million in the three years preceding the LBO to $1,264 in the third year after the LBOs for more than a 14% increase. However, capital spending was lower than the pre-LBO average in the year of the LBO and the subsequent 2 years, so that the average for the three post-buyout years is $1,121 million, an increase of 1.9 percent. The lower capital expenditures in the first two years are consistent with

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both Kaplan's and Bull's results. They find declines in capital spending of 0.6% and 21.9% and industry adjusted declines of 2.9% and 24.7% between one year before the LBO and two years after the LBO. Smith's study adds further evidence, showing a significant decline in capital spending/sales, both with and without industry controls.

A key issue, for capital spending, R&D and employment, is whether the cut-backs eliminate unproductive expenditures, or whether they signal increased myopia on the part of the LBO management? The answer to this question requires data on the long run performance and the long run competitive position of the LBO firm.

E. LBOs adequately handle negative events such as economic downturns.

In the early 1980's the U.S. experienced one of the worst post-war recessions. The 13 buyouts arranged by KKR before or during this recession survived the recession. The KKR study notes: "these buy-outs retired all debt on time and collectively provided the equity investors an annual compounded rate of return of approximately 35%" (p. 4-2). KKR also provides a two page case study on Houdaille, an LBO which overcame a number of difficulties caused in part by the early 80's recession. Thus, limited historical evidence suggests that at least buyouts arranged by KKR can survive a recession. Buyouts have changed dramatically, however, since the late 70's/early 80's. The size of LBO firms has increased, and LBOs have expanded into new industries. Perhaps most important, the competition in the market for corporate control has increased in the 1980's. Competition in bidding can lead to the winner's curse in which the bidder with the most optimistic projections wins the target firm. For example, a firm predicting economic growth will be able to outbid another firm predicting a recession, all else equal. While all firms build a margin of error into their forecasts, competition can serve to reduce that margin. In light of these possible changes, the application of KKR's early experience to a future recession must been done with caution. Moreover, as the Revco LBO indicated, LBO bankruptcies occur even in nonrecessionary periods.

F. LBOs are not run with a view to quarter to quarter earnings.

This finding is difficult to verify with concrete numbers and is therefore based on KKR's experience. Bull's interviews with institutional investors, LBO managers and LBO dealmakers supports this view. Case studies of 5 divisional LBOs by Ravenscraft and Scherer (1987) provide

some contradictory evidence. They conclude that "most of the interviewees who had made such (R&D) cuts expressed unease and hope that, once their debt burdens became lighter through repayments, they would be able to invest more in future-building activities." (p. 155)

G. LBOs yield high returns to investors.

All relevant studies show substantial returns to equity investors in the LBOs. KKR's estimated return appears conservative relative to estimates provided by Kaplan and M&V. Assuming these returns are correctly calculated, the critical questions are: what are the sources of these high returns, and how can significantly above average returns persist for over a decade in a competitive corporate control market?

H. Omitted Performance Variables.

The KKR study makes repeated references to the positive impact of LBOs on efficiency. Such improvements should show up in increases to operating income/sales, and, perhaps, sales. Unlike Kaplan, Bull, Smith, and M&V, the KKR study does not present any evidence on these two variables. Kaplan, Bull, Smith, and M&V all find improvements in sales. Kaplan finds that the LBOs' sales are not growing as fast as their industries' sales, implying a decline in market share. Bull's data yield the opposite result.

Improvements in profits/sales are found by Kaplan and M&V, but not by Bull and Smith. In Bull's sample, the industry profit rate was declining, so the LBO's profit rate, which was unchanged, looked good by comparison. Smith finds an increase in operating cash flow/sales, where operating cash flow is defined as "the net increase in cash and marketable securities arising from 'normal' operations, without considering royalty, dividend, or interest income, or gains/losses from the sale of PPE, extraordinary items, or payments of interest or dividends" (p. 13). The cash flow gains stem from a decrease in the inventory holding period and the receivables collection period and not a reduction in "discretionary expenditures." Since the gains are in accrual accounting items, it is not surprising that she finds gains in cash flow and not operating income. The studies that show improvements in operating profits do not identify the sources of the gains. Are they due to real efficiencies, or are they the result of cutbacks that will hurt long run profits?

III. Methodological Issues

Section II suggested some substantial differences in the results of post-LBO studies. This section focuses on methodology as a potential source for these differences.

A. Sample Characteristics.

By far the biggest concern about the post-LBO research is the small, potentially biased samples. According to Mergers and Acquisitions, there were 1473 LBOs between 1983 and the second quarter of 1988. Eighteen percent of these were "going private", 68 percent were divestitures and 16 percent were "private market" LBOs.[7] By comparison, the sample sizes given in Table I are quite small, less than three percent of the total number of LBOs. M&V's 35 observation sample is probably the least representative, focusing on only LBOs that succeed through subsequent IPOs. Kaplan's and Smith's samples suffer from a similar bias. For samples for which data on the second post-buyout year were available, IPO, sale or releveraged companies represented 13 of the 19 companies in Kaplan's sample, and 29 out of 58 companies in Smith's total sample. Furthermore, Kaplan provides some evidence for the existence of a "success" bias, since the 13 resale companies displayed greater operating income, capital expenditure, and employment gains (or lower losses) than the 6 non-resale companies. Smith runs a number of tests to demonstrate the lack of bias in her sample. In one test, she fails to find any significant difference between IPO companies and the rest of her sample. Since Smith and Kaplan employ similar data collection techniques and cover similar periods, there must be a substantial overlap in their samples. Thus, it is unclear why they reach different conclusion on sampling bias and other issues where they perform similar tests.

Bull's sample comes from confidential data provided by six institutional investors. It includes quite distinct LBO types, including 8 full company going private LBOs, 11 divisional LBOs, and 6 LBOs of private companies. While this diversity makes the sample more representative, it also raises the possibility that one group, e.g., divisional LBOs, may dominate the results. Ideally, we would want separate statistics on each distinct LBO type. One critical problem with small samples is that they preclude statistically meaningful sample divisions.

The KKR study includes all LBOs it performed in which it still had an equity stake as of January, 1989. Interpreted as a sample of all LBOs, it is small; only the NSF R&D study's sample

of 8 LBO and other non-merger restructurings is smaller. The KKR sample does not appear, however, to suffer from the same biases as the Kaplan, Smith and M&V studies. Still, the KKR LBOs may not be typical. They are, in fact, much larger than the average LBO by a substantial margin. The admittedly crude estimates contained in Table II suggest that the average 1988 sales value for the KKR companies was about $2.5 billion and the median sales was $1.0 billion. According to a 1984 Fortune article, the KKR companies may also be more diversified.[8] Both size and diversification have been found to be important factors in determining employment, capital spending, R&D, and firm efficiency. Size and diversification also increase the firm's ability to reduce debt through divestiture. Finally, the generality of the KKR study's finding is limited by the fact that all the LBOs were arranged by KKR. Since KKR is one of most experienced leaders in the LBO field, their firms may fare better than the norm. In any case, policies and practices clearly differ among LBO investors and KKR's focus on its own firms may limit the generality of the findings.

B. The Number of Post-LBO Data Years.

It takes time for the full effects of an LBO's success or failure to materialize. Thus, the longer the post-LBO data period, the better. Long time periods, however, would preclude an analysis of many recent LBOs for which sufficient post-LBO data are unavailable. Balancing this trade-off is difficult. Data constraints limited Kaplan, Smith and Bull to at most 2 post LBO years. The M&V study contains post-LBO data for an average of 3 years but with a range of 4 months to 8 years.

The KKR study appears to be reporting data on the post-buyout years 1 through 3 for "All KKR Companies." However, this raises a potentially serious problem. For 7 of the 17 companies, the LBO occurred in 1986 or later. Obviously, three years of post-LBO data are not available for these seven companies. The KKR study used projected data for those companies and years for which it did not have actual data.[9]

From a technical standpoint, the use of projections in a study which attempts to examine post-LBO performance is questionable. KKR's projections, whatever their basis, specifically estimate the variables under study in the report - employment, capital spending, R&D, taxes and debt -- thus confusing actual and expected performance. Both Kaplan and Bull found that LBO projections were

overly optimistic.

The use of projections is potentially serious because the seven LBOs occurring in the post-1985 period are almost six times as large as the other companies. Table 2 shows that average sales for the "1985 or before" subsample of 10 companies were $834 million, versus $4,825 million for the "1986 and after" companies. The number of employees in the two samples were 6,351 for the pre-1986 sample and 37,714 for the post-1985 sample.

Since the KKR study simply sums the employment, capital expenditures, R&D and other variables for the 17 companies without the use of ratios, the differences in average sizes become critical. In practical terms, the performance of these variables is driven by the projected data of the seven post-1985 LBOs. This is particularly true for the third post-LBO year, since post-1985 companies account for over 75 percent of the data in that year.

C. Changes in Company Structure.

A major restructuring of firms including divestitures, and in some cases acquisitions, often follows an LBO. These changes make it difficult to compare pre/post-LBO company characteristics. Bull addressed this problem by deleting firms which underwent a major restructuring. That may have introduced additional sampling bias if restructuring is related to the items of interest. Kaplan controls for restructuring "... by repeating the analyses for the subset of MBOs that restate pre-buyout financial statements for the divestitures or do not have post-buyout divestitures and acquisitions." (Kaplan(1988), p. 26) Smith splits her sample into subsamples of firms with and without asset sales. While Kaplan does not find many differences between the samples with and without restructuring, Smith provides evidence that the restructured sample is less reliable. M&V and NSF do not address the restructuring issue.

The KKR study's solution was to revise the pre-LBO data, eliminating data for subsequently divested units. While this procedure is probably superior to the Kaplan, Bull, or Smith approach, some details are needed on how the pre-LBO data were adjusted. In particular, how important were the dual problems of common cost allocation and transfer pricing and how were they addressed?

The KKR study's handling of acquisitions was much less satisfactory. The study states: "Operations that were acquired by the companies are included in the data from the date of

acquisition" (p. 3-1). The impact of including acquisitions is to bias the conclusions towards positive changes, since the acquired companies' data are included in the post-LBO, but not the pre-LBO, data. This bias is potentially serious because Owens-Illinois, Motel 6, Houdaille Industries, L. B. Foster, Fred Meyer, Malone & Hyde and U. S. Natural Resources all made significant acquisitions (p. 4-5). The acquisition of Brockway by Owens-Illinois is particularly important since, in 1986, it had sales of about one billion dollars, employment of about 12,000, capital expenditures of about 37 million dollars, and a sizeable R&D program. Why the authors decided to exclude divestitures and include acquisitions is a puzzle. In any case, the data should be reestimated with acquisitions excluded, or with the acquired companies' data added in the pre-LBO period.

D. Levels vs. Ratios.

All post-LBO studies employ some variables measured as levels instead of ratios, e.g., capital expenditures instead of capital expenditures/sales or capital expenditures/employees. Which measurement is appropriate depends on the question posed. Ratios, however, have a number of inherent advantages, including implicit adjustment for firm growth, large firm dominance, and inflation (assuming the price indexes for the numerator and denominator are similar). When levels are used, these issues must be handled carefully.

The importance of the ratio vs. level issue can be seen in the KKR study data. For R&D, capital expenditures and employment, the three year pre-LBO averages were $94 million, $1,117 million and 264 thousand workers, respectively. The post-LBO three year averages for these three variables were $106 million, $1,121 million and 302 thousand workers. In terms of levels, there was an increase in all three variables, although the change in capital expenditures is relatively small. If instead the ratios of R&D/employee and capital expenditures/employee are used, thus adjusting for firm growth, part of which stems from acquisitions, the two relative measures decline. R&D per employee drops from $360 to $350 and capital expenditures per employee drops from $4,236 to $3,708.[9]

Hidden in even the above numbers is the potential dominance of changes in a few large firms. For example, the crude numbers in Table II suggest that Safeway accounts for roughly 40 percent of the total sample employment. Suppose, to illustrate with an extreme case, Safeway had increased

employment by 15 percent and each of the other 16 firms had cut employment by 10 percent; the KKR study would have concluded that LBOs increase employment. If the KKR sample were in fact the whole population of LBOs, then perhaps this aggregation technique would make sense. However, if we are trying to make inferences from a small sample concerning general LBO tendencies, it makes little sense to let a few observations dictate the conclusion. Safeway may reflect a special case, not the general rule. The NSF study aggregates data in a manner similar to KKR's. Since NSF finds declines for all 8 LBO, buyback, and other non-merger restructurings, the method of aggregation is less important for their data. Kaplan and Bull address the aggregation issue by taking the mean of the percentage changes for each firm; M&V do so by taking the median rate of change. For the illustration given above, Kaplan's approach would add 16 firms times -10 percent and 1 firm times 15 percent for an average percentage decline in employment of 3.6 percent.

E. Adjustment for Industry Values.

Kaplan, Smith and Bull compare the performance of the LBO firm to its industry.[11] As discussed in Section II and illustrated in Table I, the industry controls are critical in a number of cases, including employment, sales and profits. Therefore, it is important to separate LBO related changes from changes in the LBO firm's industry. Industry controls should be added to the NSF, M&V, and KKR studies. NSF and M&V compared their results to economy-wide changes. The KKR study should adjust for the level of inflation, which has averaged 5% over the 1977-87 period, and real growth, which for employment has averaged about 2.2 percent over the same period.[12] Next to the U. S. average inflation and real growth numbers, the KKR study's growth rates may not seem so exceptional.

F. Usage of data from the LBO year.

The KKR study typically includes data for the LBO year in the pre-LBO calculations, arguing that these decisions are committed prior to the LBO. All other researchers avoid this practice. As Bull notes, "The year of the buyout is excluded from comparisons because it frequently includes recognition of a number of atypical events which distort comparisons" (p. 6).

Excluding the LBO year from the KKR analysis does change some of the results. For example, the study concludes, "average capital spending increased 1.9% after the LBO versus prior to

the LBO" (p. 7-2). That percentage increase is based on an average of $1,101 million pre-LBO and $1,122 million post-LBO. The $1,101 value is the average of the years (-3, -2, -1, and 0). If the LBO year is removed from the calculation, the average for the pre-LBO period is $1,117 million, indistinguishable from the post-LBO value.

IV. LBO Performance: A Research Proposal

Some of the methodological problems discussed in the last section can be addressed by a more careful employment of currently available data. However, some of the most serious problems faced by all studies stem from data constraints that cannot be solved with existing data. The small and potentially biased sample size, together with limited information on each LBO, seriously impairs our confidence in the accuracy and generality of the current post-LBO studies. Major strides in our understanding of LBOs will come only when current data constraints are lifted. With improved data we can also begin to ask a richer set of questions, focusing on the critical factors which enable an LBO to change performance. Most of the current research has struggled merely to describe a change in performance. Research needs to move beyond this and towards an understanding of how, why and under what conditions LBOs affect performance. This section describes a research proposal for correcting previous methodological problems and for addressing additional LBO related issues.[13]

A. Solutions to Methodological Problems

Three confidential data sources, the Quarterly Financial Report (QFR), the Census and Annual Survey of Manufactures, and an annual survey by the National Science Foundation (NSF), contain rich sources of information that can be employed to remove many of the current post-LBO data constraints. The Census Bureau collects the information for all three sources, and the latter two have been combined in the Longitudinal Research Data (LRD) file by the Bureau's Center for Economic Studies (CES). The authors have been granted access to these data sources, subject to confidentiality restrictions and adequate project funding.

The QFR series provides a quarterly income statement and balance sheet on all firms -- public and private -- with more than 25 million dollars in assets and a large scientific sample of firms under 25 million. By the mid-1980's 4-5 thousand firms with assets of $25 million or more were

providing data every quarter to the QFR, and another 12-16 thousand smaller firms were submitting data for some years. The reporting firms also explain in their report any change in name, state and date of incorporation, and explicitly report structural changes, such as: organization as a completely new business, change in corporate title, formation as a successor company to another company, sale of assets, merger, discontinuation of business and legal dissolution.

The LRD file contains Census and Annual Survey data on manufacturing establishments (plants) of companies. Detailed, separate data are filed by a company for each of its establishments that meet the reporting requirement. For Census years, these data contain essentially the universe of all but the very smallest manufacturing establishments. In non-Census years, the LRD file contains data on all manufacturing establishments with over 250 employees and a large scientific sampling of smaller manufacturing establishments. In 1985, roughly 56,000 establishments reported to the Annual Survey.

With the corporate status changes reported to the QFR and a list of all LBOs reported by Mergers and Acquisitions, a very large sample of LBOs can be identified. Through a careful matching of the public LBO data, the final LBO sample should maintain the properties of the QFR and LRD files, i.e., the near universe of large firms and a scientific sample of smaller firms. As indicated, a large, representative, unbiased sample is the first requirement for obtaining accurate post-LBO performance measures and for testing richer LBO hypotheses. However, other methodological problems must also be addressed, including the number of post-buyout years, changes in company structure, and industry controls.

Computerized files for the QFR data exist from: 1974 to 1988. For the LRD data, they exist from 1972 to 1987. Thus, for all but the most recent LBOs, two or more years of post-LBO data are available. This time series of data also allows the exploration of two issues ignored by other researchers. First, has the performance of LBOs changed over time? For example, has a decade of experience led to better LBOs, or has dramatically increased activity led towards more marginal LBO candidates? Second, what does the lag structure of the return to LBOs look like? Specifically, does performance improve in the first post-LBO year or does it take time for the LBO changes to take effect? Does the improved performance dissipate as the debt gets reduced or after the firm returns

to the public sector?

Use of post-LBO data for one, two, or three years limits research findings, and results in an incomplete picture of LBO performance. And, when absolute measures are used instead of relatives, much greater weight is given to the more recent, larger LBOs. The average "life cycle" for an LBO restructuring may be more like five-seven years in length, and is certainly greater than three. For the earliest 100-200 LBOs in the file, we expect to be able to capture the full cycle for each firm, and assess its performance at the end of the cycle. That will give us a picture of the long-run effects for those LBOs, so we will have a basis for reaching conclusions about whether LBOs have a positive effect on the economy.

Many LBOs refocus the firm by selling off divisions, which also helps to pare down the debt. Dramatic changes in the corporation's business unit portfolio can impair pre/post comparisons made at the whole company level. This problem is readily addressed, for manufacturing firms, by the use of establishment data in the LRD file. Because of the disaggregated nature of the LRD data, a continuous time series of plant data exists whether the establishment remains with the restructured firm or is sold off to a new or existing company. Almost no analysis has been done on the post-divestiture performance of LBO sell-offs, even though this information is needed to completely understand the impact of LBOs. For both manufacturing and nonmanufacturing firms, the QFR data provide information if the sold-off unit remains independent and has assets of $25 million or more.

A final methodological issue that needs addressing is industry controls. As Table I shows, LBO performance can look quite different when it is compared to industry changes over the same period. For manufacturing firms, the Census and Annual Survey industry aggregates provide an accurate picture of industry performance. For nonmanufacturing, the QFR industry totals can be employed, although the nonmanufacturing industries are broadly defined and require that a firm be classified into its primary industry only.

B. Key Unanswered LBO Issues.

With a combination of the confidential Census data and public sources, the major results presented in Table I can be replicated with a sample that is relatively free of bias and 10 to 50 times as large as those of previous work. Our goal, however, is to go well beyond replication of

existing work. This sections outlines four key areas that we plan to address.[14]

1. Theories of LBO Value Creation.

There are two critical issues concerning value creation. First, do the positive returns to pre-buyout shareholders and post-buyout investors stem from real improvements in company performance or from other factors such as undervalued assets, unrealistic expectations or transfers from bondholders, employees or government? Second, what factors determine the LBO's ability to enhance company performance? Following Kaplan's methodology, evidence on the first issue can be obtained by regressing changes in company performance and proxies for the other factors on the pre-LBO shareholder and post-LBO investor returns.[15] However, a primary focus of the study will be on the second issue.

There are at least four critical components of LBOs which can be linked to improved performance. First, an LBO increases leverage, which reduces management's ability to waste "free cash flows" (cash flows over and above current positive net present value projects, Jensen (1986)) and reduces the shareholder free rider problem by dramatically decreasing the number of interested outside parties who need to oversee the company's operations. Second, LBOs often convert a public company into a private one, eliminating the cost and constraints of public ownership. In some cases, however, publicly held debt still forces the company to report 10K's and 10Q's.[16] Third, management participation generally increases as a result of the buyout. This helps eliminate the agency problem that arises from a separation of ownership and control. In a few LBOs, the presumably inefficient management is also replaced. Fourth, LBOs often result in a much simpler corporate structure. This is especially true for divisional LBOs in which the division is freed from a large corporate bureaucracy. Corporate structure is also simplified and refocused when significant divestiture activity accompanies the LBO. The key is to isolate each of these individual factors.

To illustrate a potential method for identifying the role of each factor, consider the following linear regression:

$$CHPERF = \beta_0 + \beta_1 * CHLEV + \beta_2 * CHEQUITY + \beta_3 * CHMNG + \beta_4 * PUBLIC + \beta_5 * PRIVATE + \beta_6 * REPORT + \beta_7 * DIVISION + \beta_8 * DIVEST + \varepsilon.$$

CHPERF, CHLEV and CHEQUITY represent the pre-post change in performance, leverage and

equity ownership of senior management, respectively. Performance can be measured in terms of operating income/sales, cash flow, productivity, sales, or market share.[17] The other six variables are dummy variables with a value of 1 if: there is a change in senior management (CHMNG), the LBO firm remains public (PUBLIC), the LBO firm was a private firm to begin with (PRIVATE), the LBO firm goes private but still files 10K reports (REPORT), the LBO involved a division of the company (DIVISION), a significant part (10%) of the LBO firm was subsequently divested (DIVEST).[18]

The Jensen free cash flow hypothesis would predict a positive coefficient on β_1. Agency theory would predict a positive coefficient on β_2. The coefficient of CHMNG, β_3, should be positive according to the inefficient management hypothesis. The coefficients, β_4, β_5 and β_6, should be negative, since they represent cases where the benefits of going private are not fully realized. Finally, if simplifying corporate structure corrects ill-conceived diversification, as studies of merger activity by Ravenscraft and Scherer (1987) and studies of common cost and diversification by Long, et. al. (1982) suggest, then β_7 and β_8 should be positive.

Smith analyzed an equation similar to the one proposed here. Specifically, she regressed the change in operating cash flow/assets variable on changes in leverage and equity ownership, the first two variables in our equation. Her change in equity ownership variable was even more detailed, containing separate variables for officers, outside directors and other major holders. Her results are very encouraging especially given her small sample and limited time series. She found that all four variables were positive and statistically significant in the sample without assets sales. She interprets this evidence as supporting agency theory and Jensen's "free cash flow" hypothesis.

The above model can be extended in a number of ways. One is to include interaction terms, to test for the effects of two of the variables in combination. An example would be thee term CHLEV*CHEQUITY, to test the hypothesis that it takes both high leverage and significant management equity ownership to improve efficiency. Another promising extension would be to include a number of other financial, business and industry factors that might influence LBO performance. For example, the KKR study lists "criteria for selecting companies for acquisition" (p. 5-2). Many of these could be quantified and related to the ex post performance of the LBO.

2. Impact of Macroeconomic Conditions on LBOs

Post-LBO investor returns appear to be substantially above normal, as illustrated in Table I. One explanation of high returns is increased risk. An obvious potential source of increased LBO risk stems from the dangers of high leverage in a recession. How to appraise this risk in advance of a serious recession is, however, difficult.

One approach would employ available macroeconomic modelling techniques to project the performance of LBO firms if there is a deterioration in the economy. Most firms surely appraise alternative macroeconomic scenarios before making an LBO. However, independent confirmation for a large sample of LBOs of the accuracy of these projections and the extent of downside protection incorporated into the bid is needed. The firm, establishment and industry time series data available in the Census would provide a solid, consistent foundation for these forecasts. The QFR file also contains separate data for commercial loan debt and commercial bond debt, which can be used to further refine the macroeconomic models. A second approach would look at the limited historical experience available -- the early 1980's recession. This approach was employed by KKR and is subject to the criticisms discussed in section II. Our project would expand the KKR sample and compare each LBO's performance to other firms in its industry.

A related issue of considerable current interest is the impact of a recession on financial institutions which hold LBO and other high-yield debt. Key questions in this regard are: How susceptible are LBO cash flows to an economic downturn? How much of the high-yield debt risk can be diversified by holding LBOs in different industries? And how extensive and concentrated are financial institution holdings of high-yield debt? Some evidence on these questions can be obtained by evaluating portfolios of LBOs under different macroeconomic conditions. More exact answers require detailed information on the high-yield debt holdings by financial institutions. Such data exist or are being collected, and we are pursuing the possibility of linking the information with the Census data.

3. Selectivity Bias

As discussed in section III, current research into LBOs suffers from a potential selectivity bias. To evaluate current research and the potential for using public data for future research, a better

understanding of the nature of this bias is useful. The specific questions to be addressed are:

- Are IPO companies representative of all LBOs?
- Do post-LBO data differ for private companies holding public debt?
- Are post-LBO data affected by company size and diversification?
- How is the LBO performance influenced by the financial advisor?

These questions could be studied by dividing the sample into different classifications or by adding the relevant variables to the regression equation discussed above.

4. The Impact of LBOs on Other Important Variables

The Census files contain data that will provide additional details on a number of important issues, including the impact of LBOs on workers and R&D. Workers are divided into production and non-production employees. If LBOs mainly reduce unnecessary overhead, then non-production employment should decline relative to production employment. Number of employees is only part of the employment picture, of course, since wages are equally important. No study investigates the impact of LBOs on compensation per employee or total wages, two data items that can be computed with Census data. With respect to R&D, the LRD file provides more detailed and consistently defined data than are generally publicly available. We can separately identify the impact of LBOs on basic research, company financed R&D, and government funded R&D.

V. Summary and Conclusion

A recent study by KKR concluded that LBOs: "increase employment, increase research and development, yield higher taxes to the federal government, keep capital spending strong, are able adequately to handle negative events such as economic downturns, are not run with a view to quarter to quarter earnings and yield high returns to investors." We argue that methodological problems in the KKR study, together with conflicting results from other post-LBO performance research, suggests that the KKR conclusions are premature. According to other post-LBO research, LBOs reduce employment (especially relative to the industries in which they operate), decrease R&D, and reduce capital spending. The KKR findings on employment, R&D, and capital spending might be reversed if the study had: used actual instead of projected data, omitted acquisitions from the post-LBO data,

used ratios instead of levels, adjusted for growth in the LBO's industry (or adjusted for U. S. economy inflation and real growth), and omitted the LBO year from the pre-LBO data. The one KKR result that is verified by other post-LBO research is that LBOs yield high returns to investors, but these other studies are biased towards successful LBOs. In addition to the KKR findings, other researchers have generally observed increases in operating income/sales or operating cash flow/sales as a result of the LBO.

Despite some apparent differences in results, post-LBO studies, with the exception of the NSF congressional response, draw fairly favorable conclusions regarding overall LBO performance. This paper does not find that such a conclusion is incorrect. It does demonstrate that drawbacks in existing research severely limit the confidence that should be placed in any conclusion, whether positive or negative, especially with respect to long-run performance. Post-LBO research has been plagued with data constraints, including small, potentially biased samples and problems in adjusting for changes in corporate structure. Furthermore, it has provided little or no evidence on how improvements in performance are obtained and whether these improvements are sustained in the longer run. Evidence is also sparse on LBO performance in a recession and the repercussions of poor LBO performance on the banking and other financial industries.

We have attempted to go beyond simply criticizing existing work. Our proposed study is designed to obtain a large, representative time-series of post-LBO data, and to address a number of key LBO issues, several of which have not yet been explored. With this study, we intend to provide some solid answers on how, why, and under what circumstances LBOs improve performance, and on the implications of LBO performance for the general corporate governance issues of level of indebtedness, management participation in ownership, diversification, and constraints imposed by public ownership of equity.

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Table I. Results from Post-LBO Studies[1]

Variable	KKR [2]	Kaplan [3]	Bull [4]	Smith [5]	M&V [6]	NSF [7]
Sample Size	17	19	25		35	8
Employment	13%	0.0%		-17%	-0.6%	
Employment - Ind. Adj.		-15.3%				
R&D	15%			-		-12.8%
Capital Exp.	1.9%	-0.63%	-21.9%	-		
Capital Exp. - Ind. Adj.		-2.9%	-24.7%	-		
Sales		17.4%	20.2%	20.4%	9.4%	
Sales - Ind. Adj.		-8.3%	6.5%			
Oper. Inc./Sales		2.60%	0.0%	0.0%	26.2%	
Oper. Inc./Sales - Ind. Adj.		2.43%	48.0%			
Ret. to LBO equity	35-40%	113%			268%	

[1] Given the different methodologies of the various studies, this table should be taken only as suggestive of the differences in results among the studies. Employment, capital expenditures, R&D, and operating income/sales represent the difference between pre- and post-LBO values, except for NSF R&D which is the difference between 1986 and 1987 R&D for the 8 LBO, buyback, and other non-merger restructuring firms.

[2] Results are taken from the summary discussion or from charts for each variable. They are based on the changes over the seven years from three years prior to the buyout to three years after the buyout.

[3] Capital expenditures, sales and operating income/sales results are taken from Table 4.2 in Kaplan (1988). They represent the median standardized change between the year prior to the buyout and two years after the buyout. The employment numbers are based on 33 observations. They appear in Table 6.1 and represent the median standardized change between the year prior to the buyout and one to four years after the buyout, depending on data availability. The equity return data are based on 21 observations. They are drawn from Table 7.1, and are measured as the median return from the buyout completion date to the date of IPO or sale. These returns decline to 26.1% when adjusted for leverage and changes in the S&P 500.

[4] Data are taken from Tables 3, 5 and 7 in Bull (1989) and represent the change in the median value between the two years before and two years after the buyout. The unadjusted operating income/sales number is not presented in the report; it is taken from the statement that no significant change in operating income/sales occurred (p. 18). Almost one-half of the observations are LBOs of a division of a company.

[5] Employment, sales and operating income are taken from Tables 9, 8, and footnote 35, respectively. The sample size is not given because the two year or more post LBO sample varies between 29 and 3[illegible] observations. The table contains only the sign (negative in all cases) for R&D and capital spending because Smith presents data on only the ratio of R&D/sales and capital/sales. Smith did find post-LBO increases in cash flow divided by sales, but not (operating income + depreciation)/sales.

[6] Results are taken from Table 6 in Muscarella and Vetsuypens (1989). With the exception of the equity value, they represent the median rate of change between the LBO and the subsequent IPO. The employment change is based on only 26 observations, while the return to LBO equity is based on 58 observations. The equity data are presented in Table 10. Divisional LBOs represent over half of the observations. KKR was involved in 8 of the LBOs.

[7] Sample includes "companies involved in leveraged buy-outs, buybacks, or major restructurings (to avoid becoming targets of takeovers)" (NSF (1989), p. 2). Other R&D performing companies increased R&D by 5.4% over the same period.

Table II. KKR Sample Companies: Estimates of Sales and Employment

	Buy-Out Year	Source [1]	Revenues [2]	Employees
A. Buy-out Occurring in 1985 or Earlier				
A. J. Industries	77	s&p	98	1400
Fred Meyer	81	s&p	1850	16000
Houdaille Inds	79	s&p	300	5000
L. B. Foster Co	77	s&p	211	571
M&T	85	d&b[3]	50	3
Malone & Hyde	84	s&p	3000	8010
Marley Co	81	s&p	531	5200
Motel 6	85	s&p	297	8000
Pace Inds	84	s&p	2000	19300
Pacific Realty Trust	83	s&p[4]	3	24
Totals			8340	63508
Means		834	6351	
B. Buy-outs Occurring in 1986 or Later				
Beatrice Companies	86	d&b	4010	19700
Duracell	88	s&p	1000	9200
Jim Walter Corp	87	d&b	2180	17700
Owens-Illinois	87	s&p	3670	44048
Safeway Stores	86	s&p	18300	124000
Seaman Furniture Company	87	s&p	275	1350
Stop & Shop Companies	88	s&p	4340	48000
Totals			33775	233998
Means		4825	37714	
Ratio of Means - B to A			5.79	5.94
Grand Totals		42115	297506	
Means		2477	17500	

[1] s&p - Standard & Poors Register of Corporations - 1989; d&b - Dun & Bradstreet Million Dollar Directory - 1989.

[2] In millions of dollars.

[3] Company not in either of the main sources. The data are from Dun & Bradstreet Million Dollar Directory - 1988, and may be very inaccurate.

[4] Company not in either of the main sources. The data are from Standard & Poors Register of Corporations - 1988, and may be very inaccurate.

Appendix A

On May 25, 1989, at a hearing before the House Subcommittee on Telecommunications and Finance, Emil M. Sunley of Deloitte Haskins & Sells commented on this paper's review of the KKR study. In an addendum to his testimony, he presented two sets of retabulations of data used in the original KKR study. This appendix briefly analyzes the results of the retabulations.

The KKR addendum adjusts the historical capital spending and R&D data for inflation using the Implicit Deflator for Nonresidential Fixed Investment (Structures and Equipment) for capital spending and the GNP deflator for R&D. Using the consistent standard of averaging the three pre-LBO years and three post-LBO years, the new data exhibits a decline in both capital spending and R&D. The average pre-LBO level of capital spending in millions of 1987 dollars is $1,168. The average post-LBO level of capital spending is $1,104 or a five percent decline in capital spending. The comparable numbers for R&D spending are $103 pre-LBO and $101 post-LBO or a two percent decline. This one adjustment brings at least the direction of change in line with other research.

In a second retabulation, the KKR addendum presents data omitting the 7 companies for which projected data were used. The noninflation adjusted post-LBO increases in employment, capital spending and R&D appear to be even stronger for the 10 pre-1986 companies than for the 17 companies as a whole. Comparable inflation adjusted figures are not given even though inflation was significantly higher in the late 70's and early 80's. Employment increases from an average of 52 thousand over the three pre-LBO years to an average of 65 thousand in the three post-LBO years. Capital spending increases from $265 million to $311 million and R&D increases from $4.9 million to $8.3 million over the same period. This appears to demonstrate that projections were not driving the overall results. However, because of the other methodological problems in the study, it is difficult to compare the total and pre-1986 sample.

Consider the R&D data for the 10 companies. The 70 percent increase in post-LBO R&D can only be described as phenomenal. Such growth is rare for even quickly growing high tech companies which are not, according to KKR, typical candidates for LBOs. This sharp R&D rise most likely results from the failure to correct the tabulations for acquisitions or other factors

highlighted in our original analysis.

According to KKR, five of the ten companies had substantial acquisitions after the LBO. Any sizeable acquisition could explain a significant part of the observed increase in R&D. To illustrate, take Houdaille Industries acquisition of John Crane, Inc. Though John Crane was a private company, Standard & Poors and Dun & Bradstreet estimate that its sales were between $100 and $150 million and employment between 1800 and 2550 employees. According to NSF data, the 1981 and 1982 R&D to sales ratios for the industries in which John Crane operated ranged from 1.9% to 2.5%. Assuming that John Crane's R&D expenditures were typical of its industry peers, its R&D would be between $1.9 and $3.8 million. Thus, the acquisition of John Crane could explain between 55 and 100 percent of the post-LBO R&D increase.

The KKR study consistently confuses acquisitions with real economic growth. Unless synergies are created, no new productive resources are brought into the industry through acquisition. John Crane's R&D expenditures would have existed whether Houdaille acquired them or not. To illustrate this point, consider an LBO that lays off 400 employees and then buys a company with an existing employment of 500. The KKR study's logic would lead to the conclusion that the LBO had created 100 jobs. The real effect is that 400 people who had been working no longer are working.

The congressional statement by Sunley concluded with "the answers found for KKR companies contradict much of the 'conventional wisdom' about LBOs" (page 13). Unfortunately, they also contradict most of the related evidence in other LBO studies. By comparing the methodology of current post-LBO research, we have uncovered some potential explanations for the discrepancies in current research. The KKR addendum has increased our knowledge by permitting us to explore two of the methodological problems in the original KKR study. It has not changed our original conclusions about the probable post-LBO performance of the KKR LBOs.

Footnotes

[1] The data for the study were tabulated by Deloitte Haskins & Sells. An abbreviated version of this paper appeared in the Journal of Applied Corporate Finance, Spring, 1989.

[2] The paper's emphasis on the KKR study was requested by the conference chairman.

[3] For some details on the composition of the sample and methodology used in each study, see section III.

[4] The 13% number is not actually given in the text. It was calculated by finding average employment for years (-3, -1, -1, and 0) for the pre-LBO period, and average employment for years (+1, +2, and +3) for the post-LBO period, and then determining the percentage increase.

[5] Smith employs industry controls for the employee/sales variable, but not for the employment level variable.

[6] It is worth noting in this context that the definition of the term "LBO" differs across researchers and reporters. For example, some include "public LBOs," companies that restructure through a substantial exchange of equity for debt, but remain public. Others focus only on management buyouts (MBOs), in which pre-LBO senior management participates in the buyout. In our view, it is important to employ a broad definition, in order to fully understand the causes and consequences of LBOs.

[7] Source, Mergers & Acquisitions, November/December 1988, p. 50.

[8] Irwin Ross, "How the Champs Do Leveraged Buyouts,", Fortune, Jan. 23, 1984, pp. 70-78.

[9] This was confirmed in a phone conversation with a representative of KKR. Each of the companies which did not have actual data used its most recent business plan as a source for data for the study.

[10] These calculations use years -3, -2, and -1 for the pre-LBO period. If the LBO year is also used, the averages for R&D, capital expenditures and employment are $92 million, $1101 million, and 267 thousand employees, respectively. R&D per employee is $345, and capital expenditures per employee is $4,128.

[11] The industry adjustments are, however, somewhat crude. They are based on Compustat's primary industry classification. Most firms are engaged in several different lines of business, so it is inaccurate to use only a single industry control.

[12] See the 1988 Economic Report to the President. Inflation was measured as the average change in the producer price index for finished goods.

[13] Drafted by the two authors of this paper, and a colleague, Robert Eisenbeis. Currently, finding adequate funding is the only remaining major roadblock to executing our proposal.

[14] We would like to thank Mike Scherer for some seminal thoughts on the issues discussed in this section.

[15] Kaplan concludes that taxes play a key role in explaining pre-buyout shareholder returns, and that post-buyout improvements in operating income/sales play a key role in explaining post-buyout investor returns. M&V also provide support for the second finding.

[16] The cost of public ownership does not refer simply to the reporting costs of 10K's and annual reports. The broader issue is, do LBOs eliminate the "need to be concerned with short-term movements in stock price" and "the reluctance to make tough decisions because of the fear that the public market may react negatively" (KKR (1989b) p. 68).

[17] The latter measure may be especially useful, since increases in market share may reflect a long-run building strategy, whereas declines in market share may reflect a cash cow strategy.

[18] M&V begin to explore some of these questions with a simple bivariate correlation analysis. They find superior performance for divisional LBOs, LBOs that increase managerial incentives, and LBOs that stay private for more than 29 months.

Mr. WALGREN. Thank you, Mr. Long. We appreciate that, and we'll come back.

Dr. Lichtenberg.

Dr. LICHTENBERG. Thank you.

I'm an associate professor at the Columbia University Graduate School of Business and a research associate at the National Bureau of Economic Research, and I've spent the last several years working on issues of research and development, productivity growth, and related matters.

During the 1980's, the extent of merger and acquisition activity in general and leveraged buy-out activity in particular has increased substantially. As figure 1 of my testimony shows, the value of merger and acquisition transactions as a percent of GNP about tripled between 1979/80 and 1985/86.

Some people have expressed the opinion that this increase in merger and LBO activity will result in a reduction in the amount of industrial R&D investment. If this were the case, it would be cause for serious concern since numerous studies have established that R&D makes an important contribution to productivity growth and therefore to the competitiveness of U.S. industry. But data on R&D investment for both the economy as a whole and for particular firms involved in takeovers and leveraged buy-outs indicate that this fear is without foundation.

Perhaps the best measure of R&D activity for American industry as a whole is company-funded R&D investment as a percent of net sales or R&D intensity of R&D performing manufacturing companies as calculated by the National Science Foundation. This measure excludes Federally-funded R&D performed in industry which is almost entirely military and which apparently makes little, if any, contribution to productivity growth and competitiveness.

As figure 2 of my testimony shows, the R&D intensity of American industry remained virtually constant, at about 2 percent, during the 1970's but has increased sharply and steadily during the 1980's, reaching 3.15 percent in 1986/87. Industrial R&D intensity increased by over 60 percent during this period of high and accelerating takeover activity. In the vernacular, one might say that, according to these data, R&D ain't broke and we may not need to fix it.

The aggregate data cited above certainly don't provide support for the view that takeovers and leveraged buy-outs reduce R&D investment, but to reliably determine the effect of these transactions on R&D investment we need to compare data for firms involved in these transactions to data for firms not involved in them. I, along with my colleague, Donald Siegel, have performed two such studies using confidential Census Bureau data and the NSF data which formed the basis for the official R&D statistics.

The first study analyzed the effects of all changes in company ownership during the period 1977 to 1982 on the number of employees engaged in R&D using Census Bureau data on over 1,000 R&D performing establishments. We found that there was no statistically significant difference in the growth of R&D employment between establishments involved in ownership change and those not involved.

Failure to find any difference is particularly striking because we found that ownership change is associated with large reductions in other nonproduction employment, such as managers and administrators employed at corporate headquarters. Perhaps it is the latter individuals who are raising the, I believe, false alarm about the effect of takeovers on R&D.

The second study examined NSF data on R&D intensity for the years 1978 to 1986 for 43 companies involved in LBO's during that period. LBO activity grew much more rapidly than overall takeover activity in the 1980's, and due to the high debt obligations associated with leveraged buy-outs some observers have conjectured that these transactions are particularly likely to lead to cutbacks in R&D spending.

Again, our findings were not consistent with this conjecture. We found that the R&D intensity of firms involved in leveraged buy-outs increased at least as much during 1978 to 1986 as the R&D intensity of all firms surveyed by NSF. This finding is at odds with one contained in the NSF memorandum prepared for the House Subcommittee on Telecommunications and Finance.

We believe our analysis uses a better measure of R&D activity—that is, R&D intensity rather than the level of R&D. It is also based on a much larger sample of companies over a much longer period of time, and therefore we think that our numbers give more reliable evidence concerning the effects of leveraged buy-outs on research and development.

In summary, neither the macro-economic nor the micro-economic evidence is consistent with the view that leveraged buy-outs in particular or takeovers in general lead to reductions in industrial R&D investment. Of course, as the chairman has suggested, it is the output of R&D measured in terms of the quantity and quality of innovations or new and improved products and processes rather than the amount of R&D investment or input that should be our ultimate concern. We tend to focus on R&D input rather than R&D output because the latter is much more difficult to measure.

Even though takeovers and leveraged buy-outs appear to have little, if any, effect on R&D input, they may affect R&D output by changing the efficiency or productivity of R&D—that is, the output per unit of input.

We have performed several studies which indicate that takeovers, and particularly management buy-outs, tend to be followed by substantial increases in the productivity of manufacturing plants, and more recent preliminary work indicates that the same holds for airlines. It is not unreasonable to postulate that these transactions, therefore, also augment the efficiency of R&D investment and that they consequently have a positive net impact on the industrial research output of the United States.

If I may, I would just like to add a few comments with regard to some of the previous discussion on the issue of short-term versus long-term R&D. NSF has included a question about that issue in their official R&D survey, and the reporting on that question has been extremely poor, and, in fact, I believe that NSF doesn't even publish the data. Apparently R&D managers just have a very difficult time deciding what is short term and what is long term, so I

am not sure we are going to be able to get any answers on that very quickly.

Secondly, a growing phenomenon are so-called reverse LBO's; that is, companies that have undergone leveraged buy-outs and then again go public or are acquired by publicly-held corporations. So in understanding the effects of LBO's we have to understand that often LBO's are temporary.

I'll close there.

[The prepared statement of Dr. Lichtenberg follows:]

Testimony of Frank R. Lichtenberg in hearings on "Corporate Restructuring and Its Effects on R & D" before the Science, Research, and Technology Subcommittee of the House Committee on Science, Space, and Technology, July 13, 1989.

During the 1980s the extent of merger and acquisition (M&A) activity in general, and leveraged buyout (LBO) activity in particular, has increased substantially. The value of M&A transactions as a percent of GNP about tripled between 1979-80 and 1985-86. (See Figure 1).

Some people have expressed the opinion that this increase in merger and LBO activity will result in a reduction in the amount of industrial R&D investment. If this were the case, it would be cause for serious concern, since numerous studies have established that R&D makes an important contribution to productivity growth, and therefore to the competitiveness of U.S. industry. But data on R&D investment for both the economy as a whole, and for particular firms involved in takeovers, indicate that this fear is without foundation.

Perhaps the best measure of R&D activity for American industry as a whole is company-funded R&D investment as a percent of net sales ("R&D intensity") of R&D-performing manufacturing companies, as calculated by the National Science Foundation (NSF). (This measure excludes federally-funded R&D performed in industry, which is almost entirely military and which apparently makes little if any contribution to productivity growth and competitiveness.) As Figure 2 shows, the R&D intensity of American industry remained virtually constant at about 2 percent during the 1970s but has increased sharply and steadily during the 1980s, reaching 3.15

percent in 1986-87. Industrial R&D intensity increased by over 60 percent during this period of high and accelerating takeover activity.

The aggregate data cited above certainly don't provide support for the view that takeovers and LBOs reduce R&D investment. But to reliably determine the effect of these transactions on R&D investment, we need to compare data for firms involved in the transactions to data for firms not involved in them. I (along with my colleague Donald Siegel) have performed two such studies. The first study analyzed the effects of all changes in company ownership during the period 1977-1982 on the number of employees engaged in R&D, using Census Bureau data on over a thousand R&D performing establishments. We found that there was no statistically significant difference in the growth of R&D employment between establishments involved in ownership change and those not involved. Failure to find any difference is particularly striking because we found that ownership change is associated with large reductions in other nonproduction employment, such as managers and administrators employed at corporate headquarters. (Perhaps it is the latter individuals who are raising the I believe false alarm about the effects of takeovers on R&D.)

The second study examined NSF data on R&D intensity for the years 1978-86 for 43 companies involved in LBOs during that period. LBO activity grew much more rapidly than overall takeover activity in the 1980s, and due to the high debt obligations associated with LBOs, some observers have conjectured that these transactions are

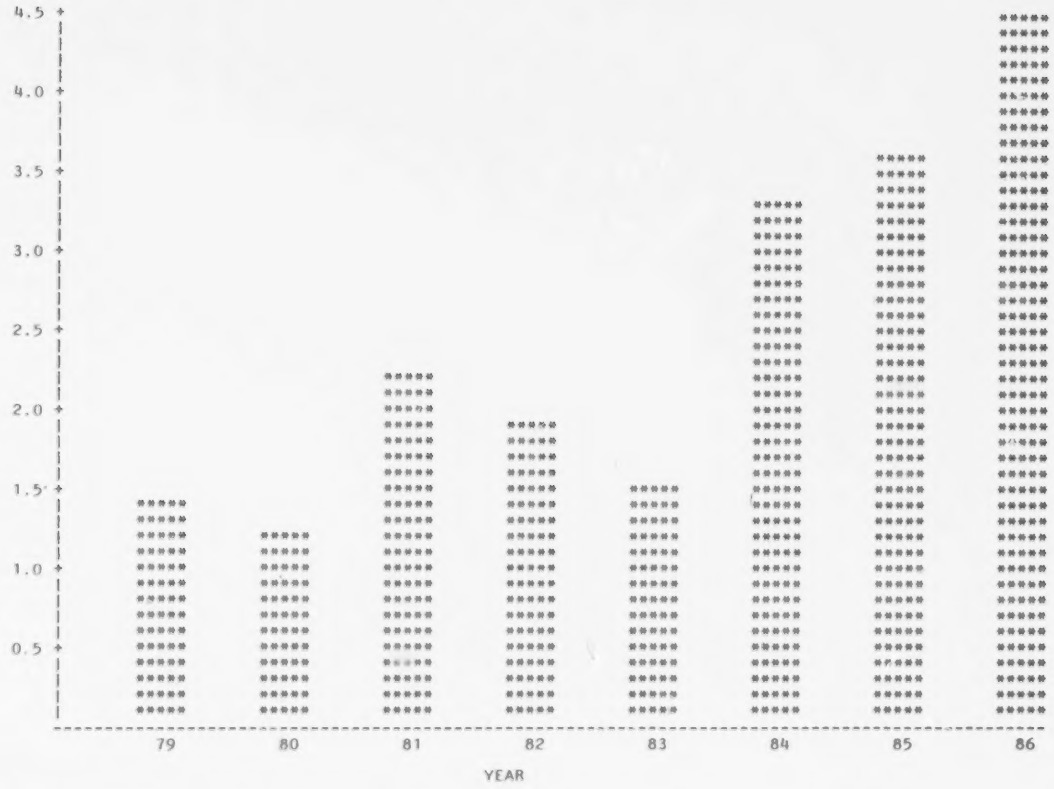
particularly likely to lead to cutbacks in R&D spending. Again, our findings were not consistent with this conjecture. We found that the R&D intensity of firms involved in LBOs increased at least as much during 1978-86 as the R&D intensity of all firms surveyed by NSF. This finding is at odds with one contained in a February 1, 1989 memorandum by NSF for the House Subcommittee on Telecommunications and Finance. But because our analysis was based on better measures of R&D activity for a much larger sample of companies over a much longer period of time, we believe our findings constitute more reliable evidence concerning the effects of LBOs on R&D.

In summary, neither the macroeconomic nor the microeconomic evidence is consistent with the view that LBOs in particular or takeovers in general lead to reductions in industrial R&D investment. Of course, it is the output of R&D--measured in terms of the quantity and quality of innovations (new and improved products and processes)--rather than the amount of R&D investment (input), that should be our ultimate concern. We tend to focus on R&D input rather than R&D output because the latter is much more difficult to measure. Even though takeovers and LBOs appear to have little if any effect on R&D input, they may effect R&D output by changing the efficiency or productivity of R&D: output per unit of input. We have performed several studies which indicate that takeovers (and particularly management buyouts) tend to be followed by substantial increases in the productivity of manufacturing plants. It is not unreasonable to postulate that these transactions

also augment the efficiency of R&D investment, and that they therefore have had a positive net impact on the industrial research output of the United States.

FIGURE 1

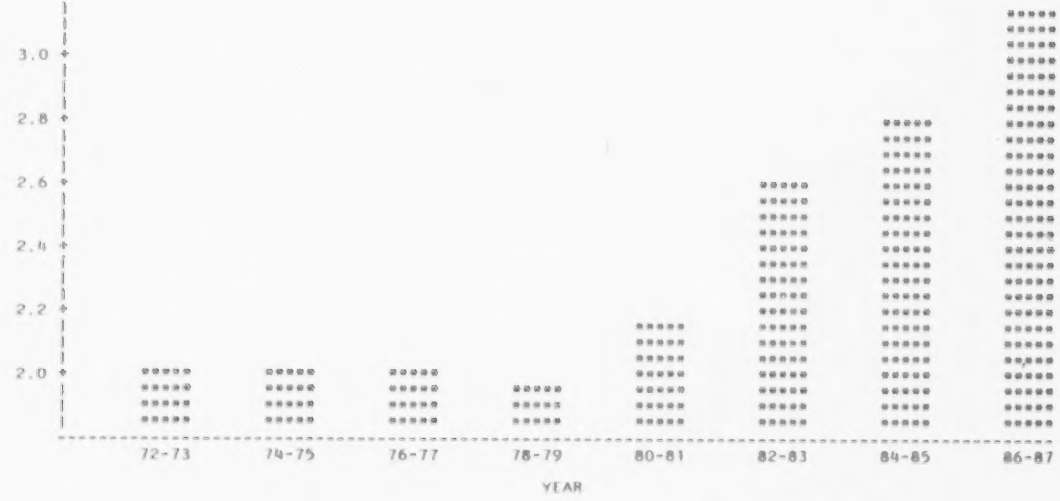
VALUE OF M&A TRANSACTIONS AS PERCENT OF GNP



SOURCES: MERGERS AND ACQUISITIONS MAGAZINE,
ECONOMIC REPORT OF THE PRESIDENT

FIGURE 2

COMPANY-FUNDED R&D AS A PERCENT OF NET SALES



SOURCE: NATIONAL SCIENCE FOUNDATION

Mr. WALGREN. Thank you very much, Dr. Lichtenberg. We appreciate that, the directness of all your testimony.

Ms. Hall, you indicated that LBO's just don't seem to be present in research-intensive companies. Why is that?

Ms. HALL. Well, the reason that KKR gave, and I think it's the correct reason, is there are a list of things that they look for in a leveraged buy-out, and those things basically consist of characteristics which guarantee that there will be a steady cash flow to service the interest on the debt which is incurred by doing a leveraged buy-out. There are going to be substantial interest payments every quarter, and what you want is a company which has a steady source of earnings, doesn't have variability in its earnings, and where you don't have other uses for that cash—namely, you don't have a growing company.

Research and development companies tend to be growing companies; that is another stylized fact which appears in the data. So that now you have a small amount of earnings to service the interest, and you need to keep spending on research and development to keep the company growing.

So I think that's the reason. I mean I think the reason is because cash flow is needed, and R&D comes out of cash flow.

Mr. WALGREN. But wouldn't its foundation be whether you were able to borrow the money? and, as I understand some of the more high-risk bonds, they really are risky, and yet there seems to be support for it, so couldn't you do an LBO in a company that didn't have the cash flow steady prospects that others might?

Ms. HALL. I'm not a complete 100 percent expert on this since I have not actually gone to Wall Street and asked, "Can you do an LBO in an environment in which you don't rely on having the cash flow to service the debt?"

The number of leveraged buy-outs as a fraction of transactions which have taken place in the last three years is still relatively small. It seems that the first place you would look would be the ones where it was easiest if that is what you wanted to do.

I'm going to have to pass a little bit on this because I haven't studied—

Mr. WALGREN. Is there some generalization that can be made about when we say leveraged buy-outs in research and development firms were relatively insignificant in terms of their size? What about restructuring involving the acquisition of some substantial measure of debt? Would that also be of a relatively irrelevant size in research and development-intensive companies?

Ms. HALL. That is what I cannot report to you today. That is what I am interested in. I think there is substantially more—my first look at the data suggests there is debt taken on around the time of public acquisitions, these are not leveraged buy-outs, it's a much bigger group, and that there may be something there, and that's really what I propose to investigate.

Mr. WALGREN. Let me recognize my friend from New York.

Mr. BOEHLERT. Dr. Lichtenberg, I was intrigued by one of your statements. What data lead you to conclude that—and I'll quote exactly—"Federally-funded R&D performed in industry makes little, if any, contribution to productivity growth and competitiveness"?

Dr. LICHTENBERG. Well, I've done a series of econometric studies of the relationship of research and development investment to productivity growth, as have a number of other individuals, and whereas we find a strong, significant relationship between productivity growth and research and development investment that is company-financed, generally we can't find any statistical relationship between Federally-funded R&D and industrial productivity growth.

Now I did use the word "apparently;" I covered myself a little bit. Partially, that may be due to measurement problems. That is, it is very difficult to measure productivity growth in the industries in which Federally-funded R&D is concentrated, that is, particularly aerospace, defense, and communication equipment. Much of the output is being sold to the Government, and there is a very serious problem of measuring productivity growth. In fact, it may be almost defined out of existence by the techniques used by the Bureau of Economic Analysis which constructs the official output numbers, so that there are some methodological issues there.

However, it is true that whereas there is a strong positive relationship between company-funded R&D and productivity growth, that generally does not exist when we talk about Federally-funded R&D.

Mr. BOEHLERT. All right. Thank you.

Ms. Hall, one or two years after, can you really get an accurate feeling for it if you just study something after the capital restructuring within 12 to 24 months? Shouldn't it really require a longer period?

Ms. HALL. This is the question whether we need five more years of data in order to answer these questions. Obviously, we would like to know what is going to happen five years from now; I would at least.

But it seems to me that if the shock of the acquisition or the leveraged buy-out is the thing, it is going to hit spending fairly quickly if it is causing increased levels of debt or something like that. I mean I don't see a mechanism which takes—in terms of cutting spending, I don't see a mechanism which takes five years to work itself out. It seems to me you are going to see that right away.

I think the real question is whether the direction of the investment has changed, is whether the types of projects are different, and that is something it is very difficult to tell in one or two years or even, you know, even in five years.

Mr. BOEHLERT. Thank you very much.

No further questions, Mr. Chairman.

Mr. WALGREN. Okay. Well, we appreciate your all being a resource to us, and I think in the interests of making sure some people make some airplanes and keep other commitments that they have we should move to the next panel. Thank you very much.

The last panel: Dr. William Miller, the president and chief executive officer of SRI International, in Merlo Park; Kenneth Lemke, vice president and technical director for Owens-Illinois; and Nathan Hurt, manager of business development from Los Alamos Technical Associates.

Gentlemen, we appreciate your coming and particularly appreciate the understanding you give to us in terms of logistically the time that it takes to gather these presentations and get them together and through.

But let's go quickly through the panel—not quickly necessarily at all; I think we have certainly 10 minutes for each of you, and that will keep us on our time frame and, I think, allow commitments to be kept.

Let's start with Dr. Miller.

STATEMENTS OF WILLIAM F. MILLER, PRESIDENT AND CEO, SRI INTERNATIONAL, MENLO PARK, CALIFORNIA; KENNETH H. LEMKE, VICE PRESIDENT AND TECHNICAL DIRECTOR, OWENS-ILLINOIS, INC., TOLEDO, OHIO; AND NATHAN H. HURT, MANAGER OF BUSINESS DEVELOPMENT, LOS ALAMOS TECHNICAL ASSOCIATES, BROOMFIELD, COLORADO

Dr. WILLIAM MILLER. Mr. Chairman, I want to thank you for inviting me to your hearings, and I also want to thank Congressman Campbell for his rather generous introduction of me earlier in the hearing.

I have submitted a written text in advance, so I'll make brief comments here and respond to questions later.

We have a happy story to tell, a very happy story, about the transition of the David Sarnoff Research Center from a corporate research—a captive corporate research organization to a contract research organization, and I'll tell you briefly how and why that happened and where we are today, what is happening today.

General Electric acquired the RCA Corporation in 1986, and they found that they had two very distinguished and important research laboratories, the Central Research Division of General Electric which is in Schenectady, New York, a very outstanding laboratory, and the RCA Laboratories in Princeton, New Jersey, again, a very outstanding laboratory.

After considerable study, they decided that they really did not need both of them, there was quite a bit of duplication, they were some distance apart, the management would be somewhat complicated indeed. They did need some of the activities of RCA in particular, but they did not need both of those, so the question was, what to do about it?

They felt it was an important laboratory that should be perpetuated, but they wanted to find some way of either spinning it out or selling it in some way that it would be carried on and contribute, as it had in the past, to the technology base in the country.

As relayed to me, GE had three goals: First, they did want the continuing support in television research which they were then doing, and that was done in the RCA laboratories, and they needed to continue that. They also wanted access to the technology pool that went beyond television in other areas because any general lab does a lot of other things. They wanted to make use of some of that within their own company, and they also wanted it in their licensing pool because they licensed that to other companies, both domestic and international, and derived a royalty income from that, so they saw that as a valuable opportunity. And, lastly, and I think

quite importantly, they really wanted to perpetuate this distinguished laboratory; they wanted to find a way to keep it going and contribute to the nation and to other industries.

Our goals, SRI's goals, were four-fold. First, it is completely within our charter as a nonprofit organization chartered to use research to help industry and governments domestically and, for that matter, internationally through research. It was within our charter to have a contract research organization of this type, and we felt that the RCA laboratories, which we now call the David Sarnoff Research Center, could be successfully converted into a contract research organization.

Secondly, we saw that their work complemented ours, so they weren't in direct competition, and added to the full spectrum of activities that we do. They are more industrial in their development than we were in Menlo Park. We do a lot of work for the Government, and particularly for the military. We were more Government-oriented, less commercially-oriented, and they are closer to the production line; they do things that are much more immediately applicable than the work that we do in Menlo Park, so that's very complementary to Menlo Park, and we felt that that fit in our spectrum of activities.

We also felt we would be making an important contribution to the Nation if we did perpetuate this important research laboratory; and, lastly, we felt we knew how to do it; we felt we had the know-how to provide the missing elements for a laboratory that had been formerly a corporate laboratory; we had the know-how to convert that to a contract research organization.

Well, where are we today? Today, in 1989, they will do about $82 million of contract research, including the work they are still doing for General Electric. Of that, about 70 percent will be commercial, about 30 percent will be for the U.S. Federal Government. Of that same mixture, that same total, about 90 percent will be domestic in the U.S., and about 10 percent will be international.

In the last year or few months more, they have made five very significant announcements of outstanding achievements. One of them is in the television area. In conjunction with NBC and ABC and Thompson Electronics, they have made the first terrestrial broadcast of a advanced television in the world. This was done on April 20 through the NBC station in New York.

Additionally, the digital video interactive technology, which is the capacity to have the very same high quality kind of television but interact with it, with a lot of detailed data in a very rapid way, including motion, this has been spun out to the Intel Company—Intel Corporation, and is being developed by them, and recently they have reached agreement with IBM that that software will be provided as an option within the IBM PC's, and giving again very great capacity for educational and training capabilities on PC's.

Additionally, they have announced the first high-temperature superconducting microwave filter that has been developed. This is perhaps the first of any of the high-temperature superconducting devices to be developed in the world, and this was announced recently.

We have recently announced the development of a surface-emitting laser diode on one chip of considerably high power, and this

will be very useful in communications and in computing, where you can use the photo-electronic method of communication to rapidly speed up the transmission of signals, where transmission is important, and that is important, as I say, in communications; it is also very important in computers. The fastest way to speed up a supercomputer is to speed up the transition time between the switching elements, which is now the slowest part in the system.

And they have also recently developed a generalized method of emulating old electronic circuits with new circuits so that when the old circuits are not available or the inventories are out of stock that one can use new circuits to emulate the old and prolong systems, particularly in this case military systems, which would become obsolescent if you couldn't get the old circuits. So using new circuits we can emulate old circuits and prolong the life of these activities.

These five announcements, we think, are quite significant two and a quarter years after our acquisition. These were activities that were started before, had been carried on before, but they didn't die away, they have continued. We have found ways to support them both from the Government and from other industries, so this kind of contribution to the technology base is being perpetuated.

The laboratories, or the Center, as we call it, is really exceeding our expectations on almost every count. They have a lot of things still to learn about contract research, but they are fast studies, they are learning them, and they are converting themselves into a very effective laboratory.

I'd like to make just one or two observations. One, we do think that as a consequence of this agreement and this activity we are continuing to make important contributions to the technology base for the country. Secondly, we think that contract research has considerable importance for the country because you are able to make research available to more organizations, to more industries, through contract research.

We think that the laboratories are even more valuable today than they were two and a half years ago. In fact, I have often said that a very good research laboratory is too important for one company. They can make their capabilities and their research available to more companies, and that is important for developing the technology base, in particular its utilization within the country.

They are more efficient than they were before. We did have to trim back the staff at the very beginning as part of the understanding and agreement, but we believe that we are doing about as much research as before with considerably fewer staff; we are a little leaner and meaner, as we would say; and we are doing more efficient work.

We think the Center is better tuned to the development and the transfer of technologies than they were before because they have had to develop a better sense of client relationship in order to see the transfer of these technologies.

So, in summary, we think this was a win/win situation. It turned out to be a winning situation for General Electric, we think it was a winning situation for SRI, and we believe it has been a winning situation for our Nation.

Thank you.

[The prepared statement of Dr. William Miller follows:]

STATEMENT TO HOUSE COMMITTEE ON SCIENCE, SPACE AND TECHNOLOGY
SUBCOMMITTEE ON SCIENCE, RESEARCH AND TECHNOLOGY

WILLIAM F. MILLER
PRESIDENT AND CHEIF EXECUTIVE OFFICER OF
SRI INTERNATIONAL

The Transition of the David Sarnoff Research Center

INTRODUCTION

Mr. Chairman, my name is William F. Miller. I am the Chief Executive Officer of SRI International and its subsidiaries, one of which is the David Sarnoff Research Center in Princeton, New Jersey. I have been engaged in research and development management for more than thirty years. On the one hand, I have conducted basic research in physics and computer science, and on the other hand, I have been involved in industrial and government research and in the venture capital business of starting new enterprises. Most of my professional life has been devoted to connecting, developing and bridging basic research to business and government applications. I have worked with private sector companies and with governments worldwide in developing technology strategies and their implementation. As the world becomes more knowledge intensive, conduct of research and its effective utilization become the centerpiece of the strategy for companies and for governments as well.

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* William F. Miller is the Chief Executive Officer of SRI International and subsidiaries, including the David Sarnoff Research Center in Princeton, New Jersey.

Today I should like to report on the transition of the David Sarnoff Research Center from a captive internal corporate research organization to a fully self-sufficient contract research organization within SRI International. We formally acquired the David Sarnoff Research Center on April 1, 1987 from the General Electric Company. The physical assets were donated to SRI International (a non-profit institution). General Electric also negotiated a research and development contract greater than two-hundred million dollars that would decline over time and would terminate at the end of five years, in 1992. We have now completed two and one-quarter years of that five-year contract. I am happy to say that all is going very well.

GENERAL ELECTRIC'S PURPOSES

Let me describe, as related to me, the purposes of the General Electric Company for seeking this agreement. After the acquisition by General Electric of the RCA Company and after considerable study, it became apparent they did not have the need for two major central research laboratories, the laboratory in Schenectady called the Central Research Division and the RCA laboratories in New Jersey. GE did need support from the RCA laboratories in certain areas, and they also felt there was an advantage in having access to that technology base. But there was a considerable amount of duplication of research. Also the management of two separate laboratories so far separated was complicated indeed.

Having come to this conclusion, their principle purposes of seeking the agreement were threefold. First they needed and wanted to negotiate an agreement that would guarantee continued support for television research to support their television businesses, although they later sold the television business to Thompson CSF. Even in that sale it was important to be able to transfer, intact, not only the manufacturing and marketing capabilities, but also the research capabilities which supported all of the television business. Second, General Electric felt it was important for them to have

access to the broader technology pool that had been developed at the David Sarnoff Research Center, and to further develop some of those technologies where they could be utilized within General Electric. They also thought that by putting the Center in good hands they would insure a continuing flow of research, deriving a substantial royalty income from the production of those technologies.

Lastly, it was clear to me that the senior officers of GE starting with Chairman Jack Welch wanted to find a way to perpetuate a great research laboratory in a way that it could contribute to industry and government in a dynamic and viable way. There are four outstanding industrial research laboratories in the United States: the Bell Telephone Laboratories; the General Electric Laboratories in Schenectady, New York; the IBM Research Laboratories in Yorktown Heights, New York; and the RCA Laboratories which we now call the David Sarnoff Research Center. Several of the officers at the highest level, as well as some of GE's directors, told me they felt it was essential to find a way to preserve these capacities for the nation and to keep intact this valuable resource for business and industry. General Electric also had a great concern for the employees of the David Sarnoff Research Center. Clearly, this concern was a part of their determination to find a viable solution. Together we have found such a solution.

SRI INTERNATIONAL'S PURPOSES

SRI International's purposes in negotiating this agreement were several.

First, to develop the David Sarnoff Research Center as a contract research organization to serve businesses and governments meets our Charter purposes. SRI International was formed in 1946 to contribute to knowledge, but especially to utilize research and knowledge to advance businesses and the work of government. We believed the David Sarnoff Research Center had

the right capacities in the form of an outstanding cadre of researchers, technicians and support personnel that it takes to have an outstanding R&D operation. Given this we felt that with our help, the Center could become a thriving contract research facility and fit well within our Charter.

Second, the work of the David Sarnoff Research Center complements our current work within the disciplines of SRI International. We have four other major groupings. We have a Sciences Group engaging in life and physical science research, development, and applications. We have an Engineering Research Group which conducts basic research and applications for the government, particularly in the military. We have a Business Research and Consulting organization engaged in developing business strategies with special emphasis on the relationship to technology strategies, and we have a Policy Group which conducts social science research and engages in economic policy research for local and federal governments.

The David Sarnoff Research Center fits into that spectrum as an industrial electronics laboratory with broad base that can be applied closer to production than the work going on within SRI International, yet in a complementary way. For example, in the materials area, SRI in Menlo Park is strong in material synthesis, whereas the David Sarnoff Research Center is especially strong in materials processing.

Our third reason for undertaking this negotiation was we believed, as did General Electric, that the perpetuation of such a distinguished Center was in the best interest of the nation, and for that matter, the world business enterprise. We would also be making a contribution by maintaining a strong technology base for business and industry. The David Sarnoff Research Center is the last remaining "major" Center of television research in the United States. A great deal of television research is conducted in a variety of places from universities to businesses, but none really cover the full complement of activities needed to support a television industry as does the David Sarnoff Research Center.

Finally, we believed very strongly that we knew how to help the Sarnoff Center make the transition from corporate to contract research. There were certain qualities and processes we brought to the table. First, we helped them develop their marketing capability. Although they had some marketing experience (both internal to RCA as well as some external), their lifeblood did not depend on marketing as much as is the case for a contract research organization. Also we had to help them with their strategic planning. In previous years their strategic planning was dependent upon the strategic planning of the whole company and the research laboratories followed those plans principally in support of the company.

Now strategic planning had to be more on its own and face a far larger audience, many companies, not just one company. Developing these plans became important to the survival of the Sarnoff Center. We also had to help them develop more project control mechanisms. Again their mechanisms suitable for contract research organizations are quite different from those required internally within a corporation.

Lastly, we had to help their professionals to understand their relationship to clients in a way they had not had to develop in the past. I am happy to say the officers and staff at the David Sarnoff Research Center are "quick studies" and have learned these needs, and they are carrying them out quite effectively.

DAVID SARNOFF RESEARCH CENTER TODAY

It was apparent in the transition from General Electric to SRI International that we would have to reduce the size of the David Sarnoff Research Center. We reduced from approximately twelve-hundred to eight-hundred fifty employees. General Electric had a very generous and humane early retirement program. More than three-fourths of those who left

in this transition left under the Voluntary Early Retirement Program. A few additional employees were terminated involuntarily but, in fact, they received the same benefit package as those who left under the voluntary program.

The David Sarnoff Research Center is now a more effective organization in terms of the total number of personnel. We believe we are carrying out nearly as much research as previously with this smaller cadre. We lost a few employees in the process that we would have preferred to retain, but overall we believe the sizing-down operation was quite successful from the viewpoint of those who left as well as those who remain. The David Sarnoff Research Center now runs at an annual revenue level of eighty-two million dollars and is growing slightly in volume, although their major task is to replace the declining research support from General Electric with research and development support from other companies and the government.

The current mix of research is seventy percent commercial and thirty percent government. Most of our work is domestic although ten percent is international. There has been some growth in staff which is remarkable given the fact there is declining support from the General Electric contract and, in addition, one group has spun out in an agreement with Intel Corporation which I shall describe later. In meeting their revenue and net income targets, according to the plan (established at the time of the acquisition), Sarnoff is running well ahead of plan. I do not want to belittle the difficulties nor the challenge of the task, indeed, it is not easy. It was a great challenge but that challenge is being met and exceeded.

The David Sarnoff Research Center continues to be a leading U.S. research laboratory in consumer electronics, high definition television, communication, electronics, computer development and applications and many allied fields of electronics. Although we have not fully integrated the Center with the rest of SRI International, we are working together and over

time we are becoming a more integrated organization. At the present time, we have booked more than sixty-million dollars of joint research that is conducted on contracts requiring contributions from both Sarnoff and SRI. We also work together in marketing, business development and a number of consulting projects to the benefit of the whole organization.

I shall not try to cover all accomplishments of the David Sarnoff Research Center, but will note some of those which have recently gained a great deal of attention.

First, in conjunction with General Electric, NBC, ABC and the NBC affiliates plus Thompson Electronics, we have developed the first terrestrial transmission of advanced television anywhere in the world. This has been transmitted as a part of regular broadcasting a number of times with no degradation on current television sets and with advanced definition for those who could receive the high definition signals. We are making a major contribution to the re-establishment of the consumer electronics industry in the United States.

Second, I mentioned the Digital Video Interactive (DVI) technology which has been transferred, under a technology agreement, to the Intel Corporation where it is being further developed. DVI permits full interaction in real time with full-motion capability. The graphic and pictorial data is stored on compact disc in large volume.

Additionally, the David Sarnoff Research Center has announced the successful operation of a high temperature superconducting microwave filter. This was done with materials provided by the Bellcore Corporation. This is one of the first practical high temperature superconducting devices made anywhere in the world.

In another example, Sarnoff has recently announced the successful operation of a surface emitting laser diode of high power which will become a major contributor to photoelectronics and its applications in

communications and computers. This breakthrough has attracted much attention and efforts are now being made to develop a consortium of U.S. businesses to further advance and utilize this new technology.

The David Sarnoff Research Center, in conjuction with SRI International, has developed a technique for emulating microcircuits. This has particular application for emulating obsolete circuits, that is, using new circuits to emulate the old circuits. By this technique, one can prolong the lifetime of major military and commercial electronic systems whose lifetime would be threatened by a lack of supply of the original circuits needed to maintain the systems. These are just a few of the outstanding achievements of the past year from the David Sarnoff Research Center. This number of achievements from one laboratory in this short period of time is an indication of its capabilities and of the importance of perpetuating such a valuable resource.

SOME OBSERVATIONS

I believe it has been demonstrated that we can preserve and enhance research capabilities, and at the same time, obtain a greater overall efficiency of our research enterprise and better develop our technology base when mergers or acquisitions make redundant some of the resources within the combined company. In fact, for a very high quality, broad based, central research laboratory, I believe the output of that laboratory is too important for one company. Much of what such a laboratory must do to focus on the problems of the company goes well beyond the immediate needs of the company. Those subsidiary outputs can be utilized by other companies. As I told the David Sarnoff Research Center staff, they now would serve all of U.S. industry, and for that matter, the world and not just one company. This opens up their possiblities and research vistas.

Contract research organizations have an increasingly important role to play in research and development. Other contract research organizations such as the Battelle Memorial Institute, the Southwest Research Institute, the Midwest Research Institute, the Southern Research Institute and the

Illinois Institute of Technology Research Institute, like ourselves, are experiencing increased corporate awareness of our ability to react quickly to a company's needs, far more quickly than an internal research organization. Contract research provides alternatives to corporate research. It permits a company to complement the work within their own organizations. Much of development today is massively interdisciplinary in its requirements. This means one needs the work from many different laboratories and many different disciplines to be brought to bear on a particular problem of the company.

Many times companies cannot or will not maintain the full complement of these capabilities. Supplementing these with the work of a research organization provides companies with a better means of solving the whole problem than trying to maintain the fullest and broadest based organization within. Contract research also provides an opportunity to get a fast start in some new area. Contract research organizations have the equipment and the people assembled, ready to be focused on a new problem, thus providing the client company a relatively low risk means of exploring what might otherwise be high risk activities. In order to explore such an opportunity within the company, one would have to recruit people, build laboratories and make a considerable investment. If it were unsuccessful, people would be terminated and laboratories decommissioned. All of these are expensive steps. It is much more efficient to employ a contract research organization for these stages of development and if the work turns out to be successful, then to either build an internal capability or form a joint venture to provide the ongoing support needed.

In various news interviews, I have seen doubts expressed about the viability of a center like Sarnoff as a contract research organization. Most of these comments come from corporate research people who have not had outside experience and have not been able to envision another successful way of operating.

SRI International is forty-three years old and we have continued to grow and build our capabilities, both domestically and internationally, over that period of time. Our total sales for 1989 will exceed three-hundred-fifty million dollars. We have a good balance in our revenues between government research (forty-five percent) on the one hand and commercial (fifty-five percent) on the other. We also have a balance between domestic (seventy-eight percent) and international as well as a balance between basic (twenty percent) and applied.

This continuing mix permits us to transfer technologies from one sector to another within the limits of our contracts and obligations and to have a broader view of the needs for technology worldwide.

By bringing the David Sarnoff Research Center into a similar mode of operation, maintaining similar balances, we are confident that they will continue to be a productive and healthy contributor to the technology knowledge base that is so vital for the development of our industries.

In sum, we have found that the David Sarnoff Research Center is more valuable today than it was two and one-half years ago, both to SRI and to the nation.

Thank you.

WILLIAM F. MILLER

MARCH 1989

CURRENT EMPLOYMENT

President and Chief Executive Officer, SRI International

Chairman and Chief Executive Officer, SRI Development Company, Inc.
(A Subsidiary of SRI International)

Chairman and Chief Executive Officer, David Sarnoff Research Center, Inc
(A Subsidiary of SRI International)

Professor of Public and Private Management and of Computer Science, Stanford University

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BUSINESS AND PROFESSIONAL

Director, Varian Associates, Inc

Director, Fireman's Fund Insurance Co.

Director, First Interstate Bancorp

Director, First Interstate Bank of California

Director, Pacific Gas and Electric Co.

Director, Annual Reviews, Inc

Director, Bay Area Council

Contributor, *Japan Economic Journal*

GOVERNMENT AND PUBLIC SERVICE

Telecommunications and Computer Applications Board of the National Research Council

Committee on Technology Commercialization of the National Academy of Engineering

Review Committee for Engineering and Applied Science, Princeton University

Commerce Department Advisory Committee on Advanced Television

U.S.-China Relations Committee

HONORS AND PROFESSIONAL SOCIETIES

Member, National Academy of Engineering

Fellow, American Academy of Arts and Sciences

Fellow, Institute of Electrical and Electronics Engineers

Fellow, American Association for Advancement of Sciences

Fredric B. Whitman Award, United Way of the Bay Area, 1982

Eminent Engineer 1989, Tau Beta Pi

PAST

Vice President and Provost, Stanford University

Director, Applied Mathematics Division, Argonne National Laboratory

Founder and Partner, Mayfield Fund

Member, National Science Board

Member, National Academy of Sciences, Computer Science and Engineering Board

Director, Greater Minnesota Corporation

Trustee, Society for Industrial and Applied Mathematics

Patron, The American-European Community Association

U.S. Delegate to European Nuclear Energy Agency

Director, Signetics Corporation

Director, Booth Financial Corporation

Consultant, Management Review Team, Computer Usage Corporation

Consultant, Continental Illinois Venture Corporation

EDUCATION

B.S., M.S., Ph.D.	Purdue University
D.Sc. honoris causa	Purdue University

Mr. WALGREN. Thank you very much, Dr. Miller. We appreciate that.

Mr. Lemke.

Mr. LEMKE. Yes. Thank you for inviting me.

Maybe preliminary comments. I am probably one of the few people here who have actually taken a research, development, and engineering laboratory through both an LBO under KKR and a merger with Brockway, and I'll speak to that as I take you through my comments.

I'm a vice president of Owens-Illinois, and I am technical director for the company and for its major operating unit, Owens—Brockway Glass Containers. My primary role is to provide technical direction for the Glass Container Unit of Owens-Illinois. In addition, as the corporate technical director, I coordinate technical efforts between the various operating units of the company.

Total sales for Owens-Illinois are approximately $3.6 billion annually. O-I is a manufacturer of glass containers for food, beverage, liquor, and wine, plastic containers, closures, and labels for the plastic packaging industry, specialty glass manufacturing, which includes Libbey tableware and Kimble scientific ware, and, finally, we have a health care unit which is the sixth largest nursing home operator in the country.

The continuing availability of advanced technology is essential to the success of Owens-Illinois in those domestic and world-wide packaging businesses. Technology is a valuable corporate asset developed through expenditures for research and engineering. Our glass containers today embody the state of the art in process technology. For example, as a result of our RD&E program we have developed the highest productivity glass forming machinery in the world, producing glass containers at the rate of over 550 bottles per minute, which is 30 percent more productive than the machines previously available.

To facilitate the access to the latest computer process control and diagnostic systems, all of our manufacturing plants are electronically linked to our central computer system in our Toledo Technical Center. Thus, electronic troubleshooting and remote engineering become instantly available through a telecommunication link.

Advanced technology is absolutely necessary if Owens-Illinois is to remain competitive domestically and internationally. The packaging industry itself is extremely competitive, with many items formerly packaged in glass now being packaged in plastics, metal, or paper containers. Furthermore, the domestic glass industry is experiencing increased competition from other North American suppliers. Imports of glass containers and containers made from other materials from Canada will increase as tariff barriers are phased out. Imports of glass containers from Mexico and other countries are already an established and viable option for U.S. glass container customers.

Owens-Illinois has the tradition of being the technological leader in the glass industry, beginning with the development and patenting of the first commercially practical automatic glass bottle forming machine by Michael Owens at the turn of the century. Today, this technological edge still exists because of our commitment to research and development.

Maintenance of this technological edge enables Owens-Illinois to continue the program it has been building since the 1950's of licensing its glass manufacturing technology to glass producers around the world. Our program has resulted in Owens-Illinois license agreements in virtually all the industrialized countries, including this country, Germany, France, Spain, England, Italy, Australia, Japan, Canada, and Latin America. We also license in the less developed countries, China and India.

In technology licensing, Owens-Illinois not only competes with other domestic glass container manufacturers but also increasingly with companies from around the world. A number of countries have stepped up their efforts to license technology in the less developed parts of the world, and we can compete only by maintaining a high degree of technological sophistication and a competent staff of engineers and technicians to provide the technical assistance to the licensee.

Owens-Illinois did not change its technological objectives after being acquired by Kohlberg, Kravis, Roberts and Company and becoming a privately-held company in March 1987. These objectives are, first, to maintain our technological superiority in the manufacture of high-quality, low-cost glass containers in the U.S.A., and, secondly, to maintain our world-wide licensing program to license state-of-the-art technology.

When Owens-Illinois became a private company in 1987, KKR endorsed and encouraged the traditional Owens-Illinois commitment to research and technology for the purpose of maintaining our competitive advantage. KKR, as a private investor, recognized that continuing research, development, and engineering expenditures are necessary for the success of the company.

A good indicator of the level of R&D activity is total expenditures. Our largest operating unit, Glass Container, which represents about $2 billion of the company's total sales, will spend about $25 million in 1989 for RD&E activities. This spending level is comparable to the RD&E expenditures in previous years.

Another good indicator of the level of RD&E activity is the number of scientists, engineers, and technicians engaged in R&D work. At the time of purchase by KKR, Owens-Illinois had a staff of 184 in the Glass Container R&D laboratories. Throughout 1987, that level remained stable. As we went through the budgeting process for 1988, we actually budgeted for an increase of 10 engineers and scientists in order to increase our R&D efforts.

KKR's emphasis on the importance of research and development was further underscored by the acquisition of Brockway Glass of Brockway, Pennsylvania, in February 1988. KKR encouraged this acquisition, recognizing the value of technological synergism between the two companies which would result in greater productivity, quality, and cost control.

The 1988 merger with Brockway Glass resulted in our bringing together two RD&E teams. Due to elimination of duplicate functions, the resulting merged group is somewhat smaller than the two previous groups had been, but the resulting organization, now located in the Owens-Illinois Technical Center in Toledo, Ohio, is 30 percent larger than the O-I group prior to the merger. In fact,

Owens-Illinois offered jobs to nearly all of the technical personnel in the Brockway organization.

Because we did not get as many people to make the transfer as we had hoped for, we have been recruiting at universities this spring to bring our total complement from 190 that we had budgeted for in 1988 to 245, which we believe is appropriate staffing to enable us to maintain our technological leadership position in the glass container industry.

From my perspective as technical director of the largest glass container manufacturer in the world, we have a much stronger technical organization for RD&E today than we had prior to the leveraged buy-out under KKR and prior to the Brockway/Owens-Illinois merger. I say that because we now have concentrated in our technical center additional resources, both people and equipment, to apply to the problems facing the glass container industry today.

In summary, the leveraged buy-out of Owens-Illinois has had no negative impact on our short-range or long-range research, development, and engineering. KKR representatives on the Owens-Illinois board have demonstrated a sincere commitment to maintaining a high level of technological strength. The merger with Brockway has added to this strength by giving us technical resources to do more development work than either company would have done had it remained separate.

Thank you.

[The prepared statement of Mr. Lemke follows:]

TESTIMONY OF KENNETH H. LEMKE
VICE-PRESIDENT AND TECHNICAL DIRECTOR
OF OWENS-ILLINOIS, INC.

Before the Subcommittee on Science, Research and
Technology of the House Science, Space and Technology Committee

July 13, 1989

My name is Ken Lemke, and I am a vice president of Owens-Illinois, Inc., and Technical Director for the Company and for its major operating unit, Owens-Brockway Glass Containers.

My primary role is to provide technical direction for the glass container unit of Owens-Illinois. In addition, as the corporate technical director, I coordinate technical efforts between the various operating units of the company.

I am a 1953 engineering graduate of the University of Toledo, in Toledo, Ohio. I joined Owens-Illinois in 1956. After various engineering and management assignments, I became Technical Director of Glass Container in 1979, the position I still hold, with the added responsibility of Technical Director for the Corporation in 1986.

Total sales for Owens-Illinois are approximately $3.6 billion dollars annually. Owens-Illinois is a manufacturer of glass containers for food, beverage, liquor and wine; plastic containers, closures, labels, for the plastics packaging industry; specialty glass manufacturing, which includes Libbey table ware and Kimble scientific ware; and finally, we have a health care unit which is the sixth largest nursing home operator in the country.

The continuing availability of advanced technology is essential to the success of Owens-Illinois in those domestic and worldwide packaging businesses. Technology is a valuable corporate asset developed through expenditures for research and engineering. Our glass containers today embody the state of the art in process technology. For example, as a result of our RD&E program, we have developed the highest productivity glass forming machinery in the world, producing glass containers at the rate of over 550 bottles per minute which is 30% more production than the machines previously available.

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Advanced technology is absolutely necessary if Owens-Illinois is to remain competitive domestically and internationally. The packaging industry itself is extremely competitive with many items formerly packaged in glass now being packaged in plastic, metal, or paper containers. Furthermore, the domestic glass industry is experiencing increased competition from other North American suppliers. Imports of glass containers and containers made from other materials from Canada will

increase as tariff barriers are phased out. Imports of glass containers from Mexico and other countries are already an established and viable option for U.S. glass container customers.

Owens-Illinois has a tradition of being the technological leader in the glass industry beginning with the development and patenting of the first commercially practical automatic glass bottle forming machine by Michael Owens at the turn of the century. Today this technological edge still exists because of our commitment to research and development. Maintenance of this technological edge enables Owens-Illinois to continue the program it has been building since the 1950's of licensing its glass manufacturing technology to glass producers around the world. Our program has resulted in Owens-Illinois license agreements in virtually all of the industrialized countries including the U.S., Germany, France, Spain, England, Italy, Australia, Japan, Canada, and Latin America. We also license in the less developed nations.

In technology licensing, Owens-Illinois not only competes with other domestic glass container manufacturers, but also, increasingly, with companies from around the world. A number of countries have stepped up their efforts to license technology in the less developed parts of the world and we can compete only by maintaining a high degree of technological sophistication and a

competent staff of engineers and technicians to provide the technical assistance to the licensee.

Owens-Illinois did not change its technological objectives after being acquired by Kohlberg Kravis Roberts and Co. (KKR) and becoming a privately-held company in March, 1987. These objectives are:

1. To maintain our technological superiority in the manufacture of high-quality, low-cost glass containers in the U.S.A., and
2. To maintain our worldwide licensing program to license state of the art technology.

When Owens-Illinois became a private company in 1987, KKR endorsed and encouraged the traditional Owens-Illinois commitment to research and technology for the purpose of maintaining our competitive advantage. KKR, as a private investor recognized that continuing research, development and engineering expenditures are necessary for the success of the Company.

A good indicator of the level of R&D activity is total expenditures. Our largest operating unit, glass container, which represents approximately $2 billion of the Company's total sales of $3.6 billion will spend about $25MM in 1989 for RD&E

activities. This spending level is comparable to the RD&E expenditure in previous years.

Another good indicator of the level of R&D activity is the number of scientists, engineers, and technicians engaged in R&D work. At the time of purchase by KKR, Owens-Illinois had a staff of 184 in the Glass Container Research Development and Engineering Department. Throughout 1987 that level remained stable. As we went through the budgeting process for 1988, we actually budgeted for an increase of 10 engineers and scientists in order to increase our research and development efforts.

KKR's emphasis on the importance of research and development was further underscored by the acquisition of Brockway Glass of Brockway, Pennsylvania, in February, 1988. KKR encouraged this acquisition, recognizing the value of technological synergism between the two companies which would result in greater productivity, quality, and cost control.

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offered jobs to nearly all of the technical personnel in the Brockway organization. Because we did not get as many people to make the transfer as we had hoped for, we have been recruiting at universities this spring to bring our total complement from 190 that we had budgeted for 1988 to 245 which we believe is appropriate staffing to enable us to maintain our technological leadership position in the glass container industry.

From my perspective as Technical Director of the largest glass container manufacturer in the world, we have a much stronger technical organization for RD&E today than we had prior to the leveraged buyout under KKR and prior to the Brockway/ Owens-Illinois merger. I say that because we now have concentrated in our Technical Center additional resources, both people and equipment, to apply to the problems facing the glass container industry today. We are already working on numerous projects which will help us be competitive into the 1990's and beyond.

For instance, the manufacturing process of our most advanced factories are now substantially computer controlled. In the near future, we expect to close the loop so that the entire manufacturing and quality control operations are linked and managed through our computer network. This is expected to further improve the efficiency and economy of our operation.

In summary, the leveraged buyout of Owens-Illinois has had no negative impact on our short-range or long-range research, development, and engineering. KKR representatives on the Owens-Illinois Board have demonstrated a sincere commitment to maintaining a high level of technological strength. The merger with Brockway has added to this strength by giving us technical resources to do more development work than either company would have done had it remained separate.

Mr. WALGREN. Thank you, Mr. Lemke. I particularly appreciate that because we have some glass manufacturers in the Pittsburgh area, and I know it is a difficult industry with very narrow margins that you have to work with.

Mr. LEMKE. Yes, it is.

Mr. WALGREN. So it is good to hear a positive experience.

Mr. Hurt.

Mr. HURT. Thank you, Chairman Walgren, for the invitation to attend this hearing.

I'm sort of a renegade in that I guess I am what you would consider a victim of a hostile takeover attempt. You have written statements. There's a page of that missing; we will get the complete text to you this afternoon.

I'm a rather recent retired executive of the Goodyear Tire and Rubber Company, and currently I'm manager of business development for Los Alamos Technical Associates, an engineering consulting firm that specializes in chemical processing for nuclear facilities and environmental services, reliability, maintainability, and safety analysis. I am also currently a member of the board of governors of the American Society of Mechanical Engineers. However, I do not represent any of those three at this hearing; rather, today I represent only myself.

I was president and general manager of Goodyear Atomic Corporation until early 1986 when the Goodyear executive management and board of directors decided to drop out of the nuclear business. At that time, I was transferred to Goodyear headquarters in Akron, Ohio, as director of research and development programs, reporting directly to the executive vice president of research and development.

In October of 1986, Mr. Jimmy Goldsmith made a run at taking over Goodyear. Goodyear fought off this takeover but, in so doing, incurred an approximately $4 billion debt. To reduce this debt, Goodyear was forced to sell almost all of its subsidiaries, consisting of Goodyear Aerospace, Motorwheel Corporation, Litchfield Farms, and all of the Celeron Corporation except the All-American Pipeline, and I understand that that is still for sale. And even with these sales, a $2 billion debt remained. Thus, these sales reduced Goodyear from a well diversified company to a company going back to basics of mainly producing tires and industrial rubber produces and some chemicals. The chemicals were primarily the raw materials that were used in their rubber products.

Goodyear had to be concerned, thus, with the cash flow that was necessary to manage this debt and certainly concentrated suddenly much more than they had almost on a weekly basis on the bottom line of the P&L.

Significant reductions were made in December for the 1987 calendar year budget for R&D. Where it had been planned to be $350 million, it was suddenly reduced to $150 million. The $350 million that had been spent each of the preceding two years was more R&D money than all of the rest of the rubber industry put together world-wide. As significant as that reduction was, though, was the policy to discontinue any program in R&D that would not show a pay-off within two years.

Goodyear also restructured significantly at that time. Reductions in personnel were tremendous. I don't recall exactly what the figure was, but I know that within the engineering force that was involved in the corporate engineering and in the R&D efforts there were well over 400 that were reduced within three months. Many of these were given the golden handshake. They reached clear down into people that were in their late forties and early fifties.

Not liking what I could see was happening to the company, having my budget cut tremendously, I saw no significant role for me there any more, so I chose to take retirement and to seek a different career. For a short time, I did consulting work in the engineering field, and then I joined with Los Alamos Technical, where I now handle projects and I do the business management planning and marketing.

In July of 1987, representing the General Engineering Technical Group of the American Society of Mechanical Engineers, I wrote a policy statement entitled "The detrimental effect of hostile takeover attempts on the United States industrial R&D programs and technical manpower." I have attached a copy of that to the statement. However, this was widely distributed through Congress at that time.

The highlights of the statement were that innovation and technology have been the major determinants of the wealth, the standard of living, and the health of the American people, and these hostile takeovers were now threatening that. The takeover attempts, whether successful or not, forced dedication to short-term corporate profitability with the resulting negative impact on industrial R&D. Business interests of companies are narrowed, product diversification is reduced, thus there is less base for R&D funds. The reduction in R&D funds results in a reduction in labor requirement, and primary these range in areas. Thus, you find that although they aren't put out of work they are certainly displaced from one company to another, and the overall effect on a long-range basis could be the reduction in our national competitive/global competitiveness.

Having no indication that much consideration of this aspect of hostile takeover attempts was being given in hearings held on this subject during 1987—for instance, those that were held by Senator Proxmire—I spent three weeks in Washington in May of 1988 pursuing the subject further and was successful in getting your committee to issue a request to the Office of Technology Assessment in July of 1988 to examine the ramifications of successful and attempted hostile and nonhostile takeovers on corporate short-term and long-term R&D investment and recommend policy options if a negative influence on R&D is noted.

It is my understanding that study will be completed some time late July or in the early part of August. I have included a copy of that letter of request that was signed by Congressman Lujan and Congressman Roe.

This concludes my testimony, Mr. Chairman. I'll be happy to answer questions.

[The prepared statement of Mr. Hurt follows:]

Written Statement

of

Nathan H. Hurt

for

The Subcommittee on Science, Research and Technology

Hearing on the Effect of Corporate Restructuring

on

Industrial Research and Development

July 13, 1989

I am Nathan Hurt, a rather recently retired executive of The Goodyear Tire and Rubber Company, currently, Manager of Business Development for Los Alamos Technical Association, Inc., an engineering and consulting firm specializing in chemical processing for nuclear facilities, environmental services, safety and risk analysis and reliability and maintainability programs. I am also currently a member of the Board of Governors of The American Society of Mechanical Engineers.

However, I do not represent any of these three at this hearing. Rather, I represent only myself.

I was President and General Manager of Goodyear Atomic Corporation until early 1986 when Goodyear Executive Management decided to drop out of the nuclear business. I was transferred to Goodyear headquarters in Akron, Ohio as Director of Research and Development programs reporting to the Executive Vice-President of Research and Development.

In October 1986, Mr. James Goldsmith made a run at taking over Goodyear. Goodyear fought off this takeover, but in so doing incurred approximately a $4 billion dollar debt. To reduce this debt, Goodyear was forced to sell almost all of its subsidiaries including Goodyear Aerospace, Motorwheel Corporation, Litchfield Farms, and all of Celeron Corporation except the All-American Pipeline (which I understand is still for sale). Even with these sales, a $2 billion dollar debt remained. These sales reduced Goodyear from a diversified company to a company producing mainly tires, industrial rubber products, and chemicals. The chemicals were primarily raw materials used in the rubber products.

and Technical Manpower". A copy is attached. This had wide distribution in Congress. Highlights of this statement were:

1. Innovation and technology have been major determinants of the wealth, standard of living and health of the American people. These are now threatened.

2. The takeover attempts whether successful or not force dedication to short-term corporate profitability with a resulting negative impact on industrial R&D.

3. Business interests of companies are narrowed, product diversification is reduced. Thus there is less base for R&D.

4. Reduction in R&D funds reduces labor requirement. Engineers thus are displaced.

5. Reduction in R&D reduces our global competitiveness.

However, having no indication that much consideration of this aspect of hostile takeover attempts was being given in hearings held on the subject in 1987, I spent three weeks in Washington in May 1988 and was successful in getting your committee to issue a request to the Office of Technology Assessment in July 1988 to examine the ramification of successful and attempted hostile and non-hostile takeovers on corporate short-term and long-term R&D investment and recommend policy options if a negative influence on R&D is

observed. It is my understanding that the study should be completed this August. (A copy of the letter of request is attached.)

This concludes my testimony Mr. Chairman. I'll be happy to answer any questions you might have.

The American Society of Mechanical Engineers

Suite 216
1825 K Street N.W.
Washington, DC 20006-1202
202-785-3756

The Detrimental Effect of Hostile Corporate Takeover Attempts

on

U.S. Industrial Research & Development Programs

and

Technical Manpower

A Policy Statement
of the
General Engineering Technical Group
American Society of Mechanical Engineers
July, 1987

Introduction

The important role of innovation and technology as major determinants of the wealth, standard of living and health of the American people has been well documented. One of the greatest threats now facing the continued vitality of corporate innovation and technology development and application is the ongoing process of restructuring within American industry forced by hostile takers, both attempted and consummated. This is especially of concern at a time when Congress and the Reagan Administration are debating what to do about America's loss of competitiveness in the world marketplace.

In January, 1985, the Petroleum Division of the American Society of Mechanical Engineers (ASME) released a statement on "The Detrimental Effect on the National Economy of Hostile Corporate Takeovers in the Petroleum Industry." Since the release of that statement, hostile corporate takeover activity has spread throughout most other fields of American business—transportation, finance, merchandising, and basic manufacturing.

The manufacturing sector has been particularly hard hit by hostile takeovers. The relatively low valuation placed on many manufacturing firms by Wall Street combined with very difficult economic times have made these firms vulnerable to takeovers, restructuring and other maneuvers to maximize shareholder value for the short term.

This present dedication to short term corporate profitability brought on by hostile takeover activities has had a strong negative impact on industrial

research and development in the United States. The current climate poses a serious threat to the health of major R&D activities in the country today.

Corporate mergers which lead to improved productivity, new methods, new products and increased utilization of research and development are an essential and beneficial part of our free enterprise system. However, the restructuring going on within industry as a consequence of takeovers, or actions in advance to avoid vulnerability, or taken afterwards do not offer these benefits, but instead have the potential for adverse impact on the technical enterprise and the strength of our nation.

Effects on Industrial Research and Development

Corporate restructuring almost always includes sales of assets, resulting in narrowing of a company's business interest and reducing its product diversification. Invariably, restructuring is also accompanied by a reduction in R&D expenditures, particularly, those of a technical exploratory nature or those which expand the breadth of technologies within the company.

Most major corporations are engaged in a multiple number of industrial sectors. Even if not, their efforts are spread over a multiple number of products. In either case, the corporation's R&D work is supported by all of the firm's revenue sources. Deliberate narrowing of the corporate focus reduces the firm's ability or willingness to embark on major R&D without quick pay-off. Three examples of companies which recently went through this process are Phillips Petroleum, Crown Zellerback and the Goodyear Tire

& Rubber Company.

We believe projections for 1987 R&D expenditures showing no reduction from the 1986 level of $118 billion are misleading. Sufficient consideration has not yet been given to the takeover threat to R&D activity. The industrial portion has made up about 53 percent of the expenditures. Increased government R&D funding could offset a drop in industrial activity. However, a sapping of industrial R&D is not necessarily beneficially offset by increased government R&D. Government funding is heavily directed toward defense and does not always find application in industry.

Effects on Technical Manpower

Most R&D programmatic funding is for labor. This labor consists predominately of engineers and scientists. Therefore, reductions in R&D funding results in reduction in this technical manpower. In addition, within a short time, cut backs or cancellations in capital expenditures for new and expanded facilities follow reductions in R&D programs. This also causes a reduction in engineering work, not only in the industrial corporation, but, also, in engineering, consulting, and construction firms. Thus displacement or unemployment of engineers and scientists is a common result of hostile takeovers. This raises the concern that as our industrial corporations return to sensibility, and again apply long range planning there may be a decline in our capability to muster and concentrate the proper technical resources.

Summary

Reductions in industrial R&D programs resulting from hostile takeover activity jeopordizes our technology base for the future, reduces our global competitiveness and results in displacement or unemployment of many engineers and scientists. We urge the federal and state governments to consider this aspect of hostile corporate takeover activities and to examine policy alternatives to mitigate the adverse impacts on the future technological strength of the nation.

This statement was prepared by the General Engineering Technical Group of ASME. It represents the considered judgement of this group, rather than an official position of ASME.

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July 7, 1988

Mr. John H. Gibbons, Director
Office of Technology Assessment
U.S. Congress
Washington, DC 20510-8025

Dear Jack:

The Committee on Science, Space, and Technology maintains a strong interest in the research and development (R&D) base of our nation's private industries. Events in the last several years have brought about a major restructuring of many corporations, and certain activities, such as hostile and non-hostile takeovers, have raised concerns about the impact of this form of corporate restructuring on R&D, and thus the nation. The Committee requests that OTA examine the ramifications of successful and attempted hostile and non-hostile takeovers on corporate short-term and long-term R&D investment, and recommend appropriate policy options if a negative influence on R&D is observed.

In particular, the Committee would like the report to address the following concerns:

1. What kinds of industries have been undergoing major restructuring as a result of hostile or non-hostile takeovers, mergers, and sales of corporate assets? Has the R&D base in these industries demonstrated any reduction in expenditures for labor, capital equipment, and investment in basic research or long-term research?

2. What trends in hostile and non-hostile takeovers have provided disincentives to corporations to pursue major R&D programs? How have corporations targeted for hostile or non-hostile takeovers responded in the areas of R&D and capital equipment investment? What immediate changes have taken place in corporate R&D following a hostile takeover?

3. What effects have attempted but unsuccessful hostile or non-hostile takeovers had on long-term and short-term corporate R&D investment? Have corporations reduced their R&D programs or redirected their efforts following successful deflection of a hostile takeover?

4. To what extent has the United States' worldwide competitiveness been affected by contractions in industries experiencing hostile and non-hostile takeovers? In the industries where competitiveness has declined, what role did reductions in R&D programs play due to hostile and non-hostile takeovers?

5. What policy options could help establish a stable environment for the U.S. industrial R&D base while allowing corporations to pursue strategies necessary to achieve sound financial positions?

The Committee is also interested in learning whether remedies may be necessary to halt possible erosion of the civilian R&D base such as: 1) increased emphasis of government-funding on R&D in areas where hostile and non-hostile takeovers have impacted corporate spending; 2) a shift to more long-term R&D in government agencies and laboratories; 3) a focus on limited joint ventures which support our industrial technology base; or 4) coordination of an effective long-term science and technology R&D policy which takes economic conditions and speculative actions by industry into account.

If you have any questions concerning this request, the staff contact is Jim Turner or Maryanne Bach of the Subcommittee on Science, Research and Technology staff at (202) 225-8844. Thank you for your consideration of this request.

Sincerely,

Manuel Lujan Jr.

MANUEL LUJAN, JR.
Ranking Republican
Member

Robert A. Roe

ROBERT A. ROE
Chairman

RL/Aeg

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The Detrimental Effect of Hostile Corporate Takeover Attempts

on

U.S. Industrial Research & Development Programs

and

Technical Manpower

A Policy Statement
of the
General Engineering Technical Group
American Society of Mechanical Engineers
July, 1987

Introduction

The important role of innovation and technology as major determinants of the wealth, standard of living and health of the American people has been well documented. One of the greatest threats now facing the continued vitality of corporate innovation and technology development and application is the ongoing process of restructuring within American industry forced by hostile takers, both attempted and consummated. This is especially of concern at a time when Congress and the Reagan Administration are debating what to do about America's loss of competitiveness in the world marketplace.

In January, 1985, the Petroleum Division of the American Society of Mechanical Engineers (ASME) released a statement on "The Detrimental Effect on the National Economy of Hostile Corporate Takeovers in the Petroleum Industry." Since the release of that statement, hostile corporate takeover activity has spread throughout most other fields of American business—— transportation, finance, merchandising, and basic manufacturing.

The manufacturing sector has been particularly hard hit by hostile takeovers. The relatively low valuation placed on many manufacturing firms by Wall Street combined with very difficult economic times have made these firms vulnerable to takeovers, restructuring and other maneuvers to maximize shareholder value for the short term.

This present dedication to short term corporate profitability brought on by hostile takeover activities has had a strong negative impact on industrial

research and development in the United States. The current climate poses a serious threat to the health of major R&D activities in the country today.

Corporate mergers which lead to improved productivity, new methods, new products and increased utilization of research and development are an essential and beneficial part of our free enterprise system. However, the restructuring going on within industry as a consequence of takeovers, or actions in advance to avoid vulnerability, or taken afterwards do not offer these benefits, but instead have the potential for adverse impact on the technical enterprise and the strength of our nation.

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Most major corporations are engaged in a multiple number of industrial sectors. Even if not, their efforts are spread over a multiple number of products. In either case, the corporation's R&D work is supported by all of the firm's revenue sources. Deliberate narrowing of the corporate focus reduces the firm's ability or willingness to embark on major R&D without quick pay-off. Three examples of companies which recently went through this process are Phillips Petroleum, Crown Zellerback and the Goodyear Tire

& Rubber Company.

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Reductions in industrial R&D programs resulting from hostile takeover activity jeopordizes our technology base for the future, reduces our global competitiveness and results in displacement or unemployment of many engineers and scientists. We urge the federal and state governments to consider this aspect of hostile corporate takeover activities and to examine policy alternatives to mitigate the adverse impacts on the future technological strength of the nation.

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Mr. WALGREN. Okay. Well, thank you very much, Mr. Hurt. We appreciate that, and I guess my question would be perhaps to the other two panelists.

Seeing the direct effect, and obviously in an individual circumstance, how do you react as businessmen to that kind of a direct reduction in important efforts that were being made by Goodyear at that point and the shrinkage of Goodyear under those kinds of forces? Can I get a general response from the other two witnesses?

Dr. WILLIAM MILLER. Well, Mr. Chairman, I would comment, first, without knowing that individual circumstance it would be improper for me to try to comment because I don't know what was going on in Goodyear. One, I think, does have to look at these case by case to really understand it.

What I try to do, I'm very operational about things. I try to look at the operational aspect and the quality aspect of things and not as much at the numbers, at the total amount of research. The total amount is clearly important, but the quality of it is also very important.

We have looked at other such opportunities. Some of them we—none of them have we undertaken, none of the others, partly because they either didn't fit in or we didn't see—

Mr. WALGREN. These would be other opportunities to—

Dr. WILLIAM MILLER. Other opportunities to acquire—

Mr. WALGREN. —to acquire a research—

Dr. WILLIAM MILLER. A research center, yes, as we did from General Electric, and we found either they didn't fit in or the people weren't entrepreneurial enough to survive in contract research, which is a rather entrepreneurial kind of activity, or in some cases we didn't think that they had high enough qualities to really make important contributions, and that sensitized me to the fact, you have to really look at the qualitative factors as well as the quantitative ones.

Mr. WALGREN. Which we have difficulty doing, of course, from a Governmental standpoint because we're obviously not in a position to evaluate quality in a sensitive way, and yet I think it would be fair to say that society-wide we have an interest in quantity, obviously.

Dr. WILLIAM MILLER. Sure. I certainly subscribe to that. Total amount is important, and then the quality, but that's why commenting on a particular case without knowing all the qualitative factors would be difficult.

Just one more comment, Mr. Chairman, on the efficiency issue. It has been commented on before by other panelists. I believe that particularly in the high-tech area U.S. industry does have to make more efficient use of research, and areas of movement, such as the consortium movement, will be attempts to find more efficient use of research and more efficient connections between research and production, products and processes, and I think we will see more of that because it will be essential for these companies to be competitive to spread their high R&D costs over a bigger base, and that is what is going on in many areas of the world, not just in the United States.

Mr. WALGREN. Being in the business of advocating contract research as opposed to an in-house operation, are there measures of

efficiency and, I gather, perhaps even quality that contract labs, supposedly being pushed perhaps more entrepreneurially or driven harder by the economics of things, as opposed to being able to shelter within perhaps an unexamined area of a larger corporate structure—are there levels of research efficiency that stand out when you look at the difference between contract lab research and corporate in-house research? How do you measure efficiency?

Dr. WILLIAM MILLER. A couple of comments there. One, I would not want to suggest that you should not have corporate research because for technology transfer to work you have to have both a sender and a receiver, so you have to have good corporate research to even receive good contract research, so you need both of those in it. But we do not have specific measures, but we do have things we observe, things that we look for.

One of the things we would look for is the connection—how frequently are the connections between the research and the people making products or inventing processes, how frequently they confer, how frequently do they transfer things, or are they off working on their own and not really talking to each other? Those become really very important measures, not quantitative measures but qualitative measures, of the importance of that group of people to the overall contribution of the company. We see it within a contract research organization. We often find people who aren't connecting to clients very well. That tells us something. They really don't have something important to say to the clients, and we find that we have to size down our operations too when we find that kind of thing going on.

So there are certain things we look for. They are not quantitative in the sense of the dollar volume.

Mr. WALGREN. What is the experience with the joint research and development consortium that have been enabled—that have always, I gather, been able to be done but have been at least given some recognition by the Congress in 1984? Have you seen those on the rise significantly?

Dr. WILLIAM MILLER. There may be others that want to comment, but yes, there is a rapid increase in the number of consortia, and they take a lot of different forms, and without going into all the different forms I would say in some cases they are very successful, in other cases perhaps less successful.

Mr. WALGREN. But a contract lab is almost a ready made consortium vehicle, isn't it?

Dr. WILLIAM MILLER. We are a sort of alternative, if you like. We perform many of the same efficiency kind of functions and transfer functions, Government work to commercial, from one commercial technology base to another technology base. We perform many of those same functions as a consortium.

Mr. WALGREN. Let me ask generally what you would feel is the greatest barrier to developing research and development in our system from your just business experience. We see this, obviously, as a problem with its impact, dramatic impact, on a number of corporate structures. But as you look across the whole of the society, if you were giving the advice, what would you focus on if your concern were increasing research and development in a business applicable sense?

Mr. LEMKE. From my point of view—and I don't have a financial background, so I'm, I guess, speaking from the standpoint of a layman, but a lot of our business is selling technology overseas.

You asked earlier how you measure the success of technology. One way I measure it is, do our licensees keep coming back? and we have licensees in Japan and France that have been with us 30 years, and they renew every five years, every 10 years, and each time there is a certain amount of discussion about, "What have you been doing for me lately?" but the fact is, they continue to renew.

Having the dollar in such a position that we can sell our technology—and we sell more than technology, we sell equipment, equipment that embodies our technology. Recently that has been much easier to do, and as we sell more of that equipment it generates more return and encourages us to spend more money on R&D to develop more equipment, to keep that flow of equipment sales going.

So the things we can do collectively to encourage or to allow for the sales of U.S. equipment overseas would be helpful to us and helpful to R&D generally.

Mr. WALGREN. Other comments?

Mr. Hurt.

Mr. HURT. Well, speaking specifically for Goodyear—and although I have been away from them two years I still have a lot of contact with them—their situation is to get themselves financially healthy enough by the reduction of that debt so that they can start putting more money back into R&D.

From an overall standpoint, I think that you have to look at, of the $120 billion a year that goes into research and development in this country, approximately half of it is Government funded, either through their own facilities or through contracts, laboratories and so forth, and about half of that, as I understand it, goes into military, and there is still a real problem in getting technology transfer from all of that development work that is going on over into private industry. I think that the Stevenson-Wydler Act has helped that some, but there still is not enough of that technology transfer that goes on that would help this situation.

Mr. WALGREN. Okay.

Dr. WILLIAM MILLER. Mr. Chairman, I think there are two factors here. Professor Hall has already commented on the cost of capital, and I think cost of capital is very important in funding research in early on manufacturing capabilities because these are very expensive now. It costs as much to establish a semiconductor fabricating facility as it does a steel mill. I mean these become very capital intensive.

So cost of capital becomes important, and we often hear American business people being criticized for short-term decisions. They make their decisions rather consistent with the cost of capital. If the cost of capital is high, you make shorter-term decisions. If the cost of capital is low, you can make longer-term decisions. So I think in the macro sense cost of capital becomes very important to fund further R&D and further development.

I think the other is industry structures. Our industry structures have grown up under a set of antitrust laws which were not commensurate with a global economy, and, as a consequence, the in-

dustry structures do not permit as rapid a transfer of technology either within the industry or across industry. In contrast, in Japan, where there are a number of consortia to which industry belongs, you find a more rapid transfer within the industry because of this common work that is being done, and because the same companies in different industries belong to those consortia you see more rapid transfer across industry. So I think industry structures brought up under our current antitrust laws have been detrimental to rapid utilization of research.

Mr. WALGREN. I see.

All right. Well, I think we had best end.

Mr. WALKER. Mr. Chairman.

Mr. WALGREN. Oh, I'm sorry, Mr. Walker. I apologize. I hadn't been looking out of the side of my—the gentleman from Pennsylvania, Mr. Walker.

Mr. WALKER. Thank you, Mr. Chairman.

Dr. Miller, I appreciate you mentioning the antitrust laws because there is one area I would like to explore with each of you, if I could, and that is, it seems to me that the whole question of R&D ultimately involves a management attitude, that a management attitude is largely reflective of what the climate is in which they are doing business and that that then comes down very much to a question of government policies. It may be antitrust, it may well be tax policies, it may be a number of things, and if we look at the whole merger climate it seems to me that in what we have done in terms of tax policy, for instance, has led some people to believe that there are short-term profits to be gained from merging companies in operating them for the short-term, not for the long-term, and that that ultimately is going to have a real impact on R&D. Is that a fairly accurate portrayal?

Mr. HURT. It is.

Mr. WALKER. So, in other words, one of our problems in R&D mergers is from people who come in simply to raid a company for its profitable enterprises. Obviously, R&D is not something which gives you much in the way of short-term profits, so they lop that off pretty quickly, and so that in any analysis of mergers you are going to find where people have come in to make short-term gains out of the company, you are going to find an R&D loss. Is that what generally is happening out there?

Mr. LEMKE. That has not been my experience. I think it obviously has been Mr. Hurt's, but it was not my experience in Owens-Illinois. We have not—our percentage of sales, which someone referred to earlier as a good measure, R&D as a percent of sales, has remained fairly constant.

Mr. WALKER. But do you have a management—as a result of the merger, do you have a management that came in with the attitude of operating the company over the long haul, or did you have a management that came in with the idea of essentially stripping the company and leaving with the profits?

Mr. LEMKE. Well, we went through an LBO, so we have the same management. I was part of management before the LBO, I'm part of management after the LBO, and our attitudes towards R&D have really not changed, it is necessary for the long-term survival of the company; and just because you are private—

Mr. WALKER. But you are looking to operate the company over the long haul. Is that correct?

Mr. LEMKE. That is correct.

Mr. WALKER. I'm speaking specifically about, you have some people who are operative out there that don't care about operating the company at all. We have a number of leveraged buy-outs or corporate mergers that are taking place with the idea simply of stripping the companies and, you know, leaving with the money, and, as I say, that is partially a result of tax policies which make it profitable to do that. In those kinds of situations I think you would agree that R&D doesn't play a very big role in that kind of situation.

Mr. LEMKE. In that kind of situation it probably would not.

Dr. WILLIAM MILLER. Yes. I think we heard earlier testimony to the effect that, if I am quoting it accurately, not many of those circumstances were cases that were involving R&D-intensive companies.

Mr. WALKER. So we have a lot of cases you don't have much R&D in those types of companies.

Dr. WILLIAM MILLER. In those situations. There may have been some, and I think you would want to refer to the earlier testimony, but they were not heavily engaged with R&D-intensive companies, it was much more other companies.

Mr. WALKER. Mr. Hurt, with regard to Goodyear, once again, to some extent government policies were involved in the fact that Goodyear Nuclear shut down to begin with.

Mr. HURT. Oh, that was just history; that had nothing to do with the takeover. The sale of Goodyear Atomic's contract with the Department of Energy was a board of directors' decision, fearing the impact upon the product which had a consumer name all over—it was a consumer product with our company name all over it.

Mr. WALKER. But the restructured company now, do you have any idea what has happened with regard to Goodyear Aerospace, Motorwheel Corporation, Litchfield Farms, Celeron? Are they engaged in R&D at the present time where they finally ended up?

Mr. HURT. Lorel bought Goodyear Aerospace. They have always been a Government contractor on electronic and control systems. They have restructured the organization completely. I have some dealings with their branch in the Phoenix area, and I don't see a lot of research work going on there. I don't have personal knowledge, but I don't see it going on.

As far as Litchfield Farms, that only contributed revenue into a large pot which allowed research to do in other fields.

Motorwheel was taken over on a leveraged buy-out by several of the top executives there, and I have no knowledge of what is going on there.

Celeron's work had primarily been that work of a development nature for the All-American Pipeline which is now in and in operation. My contacts with them indicate there is nothing going on other than trying to sell that pipeline.

Mr. WALKER. Now you indicated that the diversified company became a company mainly producing tires, industrial rubber products, and chemicals, and that they were left with little then in the way of an R&D budget for that. I, among other things, drive race

cars, and I know that over the last few years, though, Goodyear has put a lot of money into racing tire development. I mean they are practically the exclusive supplier of racing tires in the world. Now is that included under their R&D budget?

Mr. HURT. That is, and they have reduced that substantially, whereby they are only doing the development work on the tires for the Indy 500 tires. That which was for Formula One was completely eliminated, and anyone that wants a Goodyear tire for a Formula One now just has to buy it as it is. If he wants to pay for the development for a better tire—

Mr. WALKER. They still supply NASCAR; they are not the exclusive supplier to IMSA, but they have a fairly substantial involvement in IMSA.

Mr. HURT. The only one they are doing development work on is the Indy 500.

Mr. WALKER. You know more about it probably than I do, but that doesn't square. I mean they are literally developing new compounds for every NASCAR race. I mean Goodyear had Hoosier competing with them on the NASCAR circuit for a period of time over this year. Hoosier dropped out. The only company doing any development work at the present time is Goodyear, and Goodyear is developing new compounds for virtually every race on the NASCAR circuit. So I mean they have got to have some kind of a financial involvement in that.

Mr. HURT. Hoosier came into the picture after I had retired. When I left, the policy was that they were not going to spend any development money on anything other than the 500—the Indy 500 cars. Hoosier might have forced them into some development work, particularly just on the compounding, that I wouldn't be aware of.

Mr. WALKER. Okay.

Thank you, Mr. Chairman.

Mr. WALGREN. Thank you, Mr. Walker, and I hope that all of you will be able to make your transportation plans and appreciate your being a resource to us. I especially want to recognize Mr. Hurt's role in triggering the OTA study that we will be looking at very directly in the aftermath of this hearing and look forward to talking all of you about it. Thanks very much.

[Whereupon, at 12:05 p.m., the subcommittee was adjourned.]

APPENDIX

Presentation

on

Leveraged Buy-Outs

by

KOHLBERG KRAVIS ROBERTS & CO.

JANUARY 1989

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KOHLBERG KRAVIS ROBERTS & CO.

Kohlberg Kravis Roberts & Co. ("KKR") was founded in 1976 by Jerome Kohlberg, Jr., Henry R. Kravis and George R. Roberts for the sole purpose of making equity investments in leveraged buy-outs. The three founding partners began making this type of investment in the 1960's and their experience of over twenty years spans a variety of market and economic conditions. With offices in New York and San Francisco, KKR's professionals have diverse and extensive experience in business, banking, accounting and law.

Since its inception, KKR has

- Raised through six investment funds equity capital totalling approximately $8 billion of which more than $3 billion has been invested as common equity in 31 management buy-outs arranged by KKR, with another $1.5 billion projected to be invested in RJR Nabisco, Inc. ("RJR Nabisco") in the near future.
- Raised over $37 billion in financing for its leveraged buy-outs during the past 12 years, making it by far the largest firm specializing in leveraged buy-outs.
- Provided its investors with a diversified and high quality portfolio of leveraged buy-outs. Each investment is made independent of all others and is structured to accommodate its particular needs.

KKR is recognized as the leader in the leveraged buy-out field and has

- Completed the first large leveraged buy-out of a public company, Houdaille Industries, Inc., in May 1979 for $370 million.
- Completed the first billion dollar leveraged buy-out, Wometco Enterprises, Inc., in April 1984 for $1.1 billion.
- Completed the first large leveraged buy-out of a public company by a tender offer, Malone & Hyde, Inc., in August 1984 for $708 million.
- Completed the largest leveraged buy-out to date, Beatrice Companies, Inc., in April 1986 for $8.2 billion.

On November 30, 1988, affiliates of KKR signed a definitive merger agreement to acquire RJR Nabisco for approximately $24.8 billion in cash and securities.

LEVERAGED BUY-OUTS ORGANIZED BY KKR

Company (Owner Prior to Buy-Out) —Description of Business	Date of Investment
A.J. INDUSTRIES, INC. (NYSE)—Company is a diversified manufacturer of industrial products.	1977
L.B. FOSTER COMPANY (Privately Held)—Company is a distributor and manufacturer of oil country tubular goods.	1977
U.S. NATURAL RESOURCES, INC. (ASE)—Company produces coal and manufactures lumber milling machinery.	1977
HOUDAILLE INDUSTRIES, INC. (NYSE)—Company is a manufacturer of pumps, machine tools and other industrial products. In 1981, Houdaille acquired Crane Packing Company for $204 million through leveraged financing.	1979
SARGENT INDUSTRIES, INC. (ASE)—Company manufactures a variety of control devices.	1979
F-B TRUCK LINE COMPANY (OTC)—Company is a regional carrier. This company was acquired by Eagle Motor Lines as a management buy-out.	1979
EATON LEONARD CORPORATION (Privately Held)—Manufactures computer-controlled tube bending machine tools.	1980
THE ROTOR TOOL COMPANY (Cooper Industries, Inc.)—Manufactures heavy duty tools for industrial applications.	1981
THE MARLEY COMPANY (NYSE)—Manufactures water cooling towers, heating systems; also constructs and maintains municipal water wells.	1981
LILY-TULIP, INC. (Owens-Illinois, Inc.)—Manufactures disposable paper and plastic containers.	1981
PT COMPONENTS, INC. (FMC Corporation)—Manufactures power transmission products.	1981
FRED MEYER, INC. (OTC)—Company is a retailer in the Pacific Northwest selling a wide range of general merchandise.	1981
NORRIS INDUSTRIES, INC. (NYSE)—Company is a diversified manufacturing company with operations in building and remodeling products and industrial and defense products.	1981
PACIFIC REALTY TRUST (ASE)—Company was a closed end real estate investment trust based in Portland, Oregon with a portfolio consisting primarily of real estate equity investments.	1983
DILLINGHAM CORPORATION (NYSE)—Company is engaged in international heavy construction activities, distribution of propane gas, and barge and towing operations.	1983
GOLDEN WEST TELEVISION (Gene Autry & Signal Companies)—Company owned KTLA, Channel 5, which is the leading independent television station in Los Angeles.	1983
AMSTAR CORPORATION (NYSE)—Nation's largest manufacturer and distributor of nutritive sweetners as well as an important supplier of industrial and technical products.	1984
WOMETCO ENTERPRISES, INC. (NYSE)—A leisure-time corporation with interests in television broadcasting, Coca-Cola bottling, cable TV, automatic vending and entertainment.	1984
MALONE & HYDE, INC. (NYSE)—Company operates in two primary business segments: food distribution and related services and specialty retailing.	1984
COLE NATIONAL CORPORATION (NYSE)—Company is a specialty retailer conducting business through 1700 retail outlets in two primary business segments: toy supermarkets and specialty service retailing.	1984

LEVERAGED BUY-OUTS ORGANIZED BY KKR (Continued)

Company (Owner Prior to Buy-Out) —Description of Business	Date of Investment
PACE INDUSTRIES, INC. (City Investing Company)—Company consists of four companies acquired from City Investing. Business segments include manufacturing, sales and distribution of residential air conditioners, warm air furnaces, water heaters and steel and plastic containers; contracting to provide airframe maintenance; manufacturing of business forms; and other printing.	1984
MOTEL 6, INC. (City Investing Company)—Company is a budget motel chain with over 42,000 rooms in 39 states.	1985
M&T, INC. (Privately Held)—Company operates shopping centers and two ranches in the Sacramento Valley and provides construction services and materials.	1985
STORER COMMUNICATIONS, INC. (NYSE)—Company owns and operates television stations in Atlanta, Boston, Cleveland, Detroit, Milwaukee, San Diego and Toledo.	1985
BEATRICE COMPANIES, INC. (NYSE)—Beatrice is a worldwide producer and marketer of food and food-related products as well as a broad range of non-food products.	1986
SAFEWAY STORES, INCORPORATED (NYSE)—Company operates approximately 2170 conventional and "superstore" supermarkets, warehouse type grocery stores and several other specialty retail food stores in the United States and Canada.	1986
OWENS-ILLINOIS, INC. (NYSE)—O-I is a diversified manufacturer of glass and plastic containers and other packaging products.	1987
JIM WALTER CORPORATION (NYSE)—An industrial company, offering a highly diversified line of products and services for residential and non-residential construction and water and waste water transmission.	1987
SEAMAN FURNITURE COMPANY, INC. (OTC)—Specialty retailer of furniture.	1987
THE STOP & SHOP COMPANIES, INC. (NYSE)—Operates over 100 supermarkets and over 160 discount department stores in the Northeast and Mid-Atlantic States.	1988
DURACELL INC. (Kraft)—Duracell manufactures high performance alkaline batteries.	1988

INTRODUCTION

Generalizations about leveraged buy-outs are extremely difficult because a leveraged buy-out is a financing technique and not a type of business. The businesses purchased by means of leveraged buy-outs run the gamut from machine tool manufacturing to budget motels. Even as a financing technique, leveraged buy-outs defy generalization because (i) the amount and type of debt used to acquire each company varies significantly from buy-out to buy-out and (ii) a diverse group of sponsors for leveraged buy-outs exists, including firms specializing in buy-outs, investment banks, corporations and management groups, and each of these sponsors has its own style and philosophy in addition to different objectives and methods for managing the acquired company.

Despite these difficulties in generalizing, KKR has attempted to respond to the most frequently asked questions regarding leveraged buy-outs based on its principals' more than twenty years of buy-out experience, including more than twelve years of sponsoring buy-outs at KKR. The statistics utilized are the result of a tabulation of data provided by the 17 companies acquired through leveraged buy-outs in which KKR still has an ownership position.

KKR believes that this data and the other materials provided in this presentation form the basis for understanding the leveraged buy-outs which it has sponsored and their consequences. The data provided demonstrates that, contrary to statements and generalizations which are frequently made, leveraged buy-outs are an effective technique for acquiring a company and result in more efficient and more profitable operations which:

- **Increase employment**
- **Increase research and development**
- **Yield higher taxes to the federal government**
- **Keep capital spending strong**
- **Are able adequately to handle negative events such as economic downturns**
- **Are not run with a view to quarter to quarter earnings**
- **Yield high returns to investors.**

A leveraged buy-out is NOT a technique that is appropriate for all businesses. For example, leveraged buy-outs are generally not appropriate for high technology businesses. For those companies where a leveraged buy-out is appropriate and has occurred, the results, with few exceptions, have been very positive. **A key to these successes has been the creation of an enterprise in which management has an ownership stake, so that control, ownership and management of the enterprise rest in the same hands, thereby creating an incentive to maximize the long-run value of the enterprise.** Another key to success is the structuring of each transaction in light of the on-going needs of the acquired enterprise. If the transaction is structured properly, the acquired business will be a highly efficient and vibrant organization with a capital structure that minimizes the risks inherent in leverage.

Leveraged buy-outs have been successful under all market conditions, including high and low interest rates, rising and falling stock markets and high and low rates of inflation. Such transactions have become an important part of America's continuing move to efficiency. They should remain an integral part of that process.

METHODOLOGY

KKR collected information with respect to employees, research and development, capital expenditures, taxes and other matters from each of the 17 companies for which it has sponsored a leveraged buy-out and in which it currently has an equity position. The information was tabulated by Deloitte Haskins & Sells and reviewed by KKR. The data was checked to ascertain that the companies provided the financial information on a uniform basis.

The companies in the data base are:

A.J. Industries, Inc.
L.B. Foster Company
Houdaille Industries, Inc.
The Marley Company
Fred Meyer, Inc.
Pacific Realty Trust
Malone & Hyde, Inc.
Pace Industries, Inc.
Motel 6, Inc.
M&T, Inc.
Beatrice Companies, Inc.
Safeway Stores, Incorporated
Owens-Illinois, Inc.
Jim Walter Corporation
Seaman Furniture Company, Inc.
The Stop & Shop Companies, Inc.
Duracell Inc.

KKR has a continuing investment in Union Texas Petroleum, but because this investment is a joint venture with Allied Corporation and was not financed as a typical leveraged buy-out, Union Texas Petroleum has been excluded for all purposes from this study.

Except for the information included in Sections 9 and 10 with respect to taxes and debt, which information relates to all operations, the data provided by the companies relates to operations which they have retained or were responsible for closing, if any. Except as indicated in the preceding sentence, a business, subsidiary or division which was sold is excluded for all purposes, i.e., in periods both before and after the leveraged buy-out. KKR attempted to get data with respect to operations sold but in most cases KKR was unable to obtain the information or the information was not sufficiently verifiable to be reliable. Operations that were acquired by the companies are included in the data from the date of acquisition. One acquisition which is included in the data and is noteworthy because of its size is the Brockway, Inc. acquisition by Owens-Illinois, Inc. This acquisition occurred in the first year following the buy-out of Owens-Illinois.

From a definitional standpoint, KKR instructed its companies that (i) "taxes paid" means the provision that the company accrued on its books for federal taxes currently payable and (ii) "capital spending" means the amounts spent on property, plant and equipment and does not include acquisitions.

The method for counting employees was determined by each company and is consistent with their past practice. By company, the method for determining total number of employees is consistent from year to year. There has been no attempt to require all the companies to employ a uniform method for counting their employees.

ANSWERS TO SOME GENERAL QUESTIONS ABOUT LEVERAGED BUY-OUTS

1. **Do leveraged buy-outs result in more or less tax revenue being paid to the Internal Revenue Service? Are leveraged buy-outs tax motivated?**

   - Taxes paid to the federal government as a result of a leveraged buy-out exceed taxes which would have been paid if no buy-out had occurred. Section 9 of this presentation explains in detail why this increase occurs. The principal reasons are:
     - There is a substantial amount of additional taxes paid in the year of the buy-out as a result of capital gains realized by the selling shareholders.
     - The same interest payments which give rise to tax deductions by the interest payer are taxable to most of the recipients.
     - Taxes are paid on any gains from asset dispositions which follow the buy-out.
     - The new owners of a company subject to a leveraged buy-out realize substantial capital gains upon any disposition of their investment.
   - Recent tax legislation has eliminated tax benefits that were available in leveraged buy-outs. Improved long-term profitability and cash flow rather than tax factors are the primary motivations for taking a company private.

2. **What is the effect of leveraged buy-outs on employment?**

   - As a general matter, leveraged buy-outs do not result in lay-offs of employees. The total number of employees in KKR owned companies has increased from 276,000 in the LBO year to 313,000 three years after the LBOs. The average annual rate of growth has increased from 2.3% before the LBOs to 4.2% after the LBOs.
   - Because the aim of a leveraged buy-out is to increase the profitability of the acquired business, the management will attempt to keep the morale of the employees high and to keep them motivated and efficient. Layoffs without good economic cause are senseless and counter-productive.
   - Each KKR leveraged buy-out results in an independent and discrete business which requires that all management functions remain. Therefore, unlike an acquisition by a corporate buyer of another company, where duplicate functions can be eliminated (e.g., corporate office, data processing, plant sites), KKR leveraged buy-outs do not result in large departmental lay-offs.
   - Any reductions which do occur are likely to fall predominantly in the corporate overhead area, including, for example, areas such as public relations where specialized help is no longer required because the company is no longer public.
   - Over the long-term an increase in profitability is likely to lead to the creation of more jobs and increased manhours. In 1984, for example, 100,092,000 manhours were used to operate 1,273 Safeway stores. In 1988, 118,000,000 manhours were used to operate 1,155 Safeway stores.
   - When businesses are sold by a company after a buy-out, employment is also likely to increase in those businesses. Businesses are often sold by a company after a leveraged buy-out because they produce relatively poor returns. The buyers of these businesses expect to make a profit where the seller could not. To turn around these businesses, the buyers will generally have to increase sales, which should be reflected by an increase in jobs.

3. **Can management buy-outs withstand downturns in the economy and other negative events?**
   - KKR arranged 13 leveraged buy-outs from May 1, 1976 to December 31, 1982. All of these buy-outs were owned through the recession in the early 1980's when the prime interest rate rose to over 20%. Despite the recession, these buy-outs retired all debt on time and collectively provided the equity investors an annual compounded rate of return of approximately 35%.
   - Each leveraged buy-out is carefully structured and designed to meet its working capital, capital expenditure and other financial requirements.
   - See Section 12 of this presentation for a case study involving Houdaille Industries, Inc., a machine tool manufacturer whose business faced serious difficulties due to recession and foreign competition during the period subsequent to the buy-out.

4. **What is the effect of leveraged buy-outs on capital spending?**
   - Capital spending has remained strong in KKR owned companies in the years following leveraged buy-outs. Capital spending in KKR owned companies increased from $1.054 billion in the year of the buy-outs to $1.264 billion three years after the buy-outs. Following a slight decline in the first year immediately following the buy-out, capital spending increased in each year thereafter and in the third year after the buy-out exceeded capital spending in the first year after the buy-out by an average of 20% and exceeded the average capital spending prior to the buy-out by over 14%.
   - The long-run objective of a leveraged buy-out is to create value for the owners by increasing profitability and efficiency. Failure to make capital expenditures without good economic cause is, therefore, short-sighted and counter-productive.

5. **What is the effect of leveraged buy-outs on research and development?**
   - KKR owned companies, on average, increased spending on research and development by 19% immediately after the buy-out. On average, over the period subsequent to the buy-out, research and development spending was 15% higher than during the period preceding the buy-out.
   - As has been stated before, the long-run objective of a leveraged buy-out is to create value for the owners by increasing profitability and efficiency. Research and development spending is an investment in the future. Managers trying to maximize value do not stop research and development, which generally does not constitute a large cash outlay, unless such spending is wasteful.
   - The companies most appropriate for a leveraged buy-out generally have well-established products, are not in high technology businesses and do not, therefore, require large-scale research and development to remain competitive.

6. **Is corporate leverage either in the United States economy as a whole or in leveraged buy-outs in particular excessive?**
   - Corporate debt has grown at a slower rate than either consumer debt or government debt during the past 10 years.
   - Overall, United States corporations are under-leveraged compared to foreign competitors.
   - The ratio of debt to the market value of equity in the United States industrial sector is 57%, its lowest level in 15 years. Book value, which is far below market value, does not reflect the appreciation in asset values in United States industrial companies.

- Debt is reduced rapidly in a leveraged buy-out:
  - KKR owned companies have borrowed a total of $21.4 billion from commercial banks and repaid on a timely basis $14.4 billion of these loans. The balance of these borrowings has not yet become due.
  - Overall, KKR owned companies have borrowed a total of $33.6 billion from all lenders and thus far have retired on a timely basis $20.9 billion. The balance of these borrowings has not yet become due.
  - In KKR owned companies, total debt declines by over 25% within three years of the buy-out while more than 60% of commercial bank debt is repaid within three years of the buy-out.
  - For example, in the leveraged buy-out of Beatrice, bank debt of $3.5 billion was fully repaid within two years. In the leveraged buy-out of Safeway Stores, bank debt started at $2.7 billion and fell within two years to a balance of $550 million even after giving effect to reborrowings of $538 million to redeem shareholder securities.
- Leveraged buy-outs are only one of the activities which have resulted in increased indebtedness of corporations. Increased leverage also results from acquisitions by industrial buyers and from recapitalizations (e.g. special dividends, self tender offers and share repurchases). An examination of the effect of leveraged buy-outs, therefore, addresses only one aspect of the more general acquisition phenomenon. Leveraged buy-outs represent only a small part of overall acquisition activity.

7. Who are the investors in leveraged buy-outs?

- Various investors have participated in leveraged buy-outs sponsored by KKR since 1976, including 11 state pension funds, 18 corporate pension funds, 21 commercial banks, 8 insurance companies, 6 universities and a variety of others. The pension funds that have participated cover hundreds of thousands of individuals who have benefited from the high equity returns realized by leveraged buy-outs.
- In addition, in order to create incentives to improve profitability, management of every KKR owned company is given an opportunity to own a meaningful amount of equity of the company.

8. Are companies run more efficiently after a leveraged buy-out?

- In every KKR leveraged buy-out, managers and employees own a significant amount of equity. By virtue of their ownership, these managers and employees have every incentive to maximize over the long run the value of the business by running it efficiently. Indeed, management ownership avoids the often-cited costs, including the emphasis on increasing assets, sales and short-term profitability, which result from the separation of management and ownership in public corporations.
- **After a leveraged buy-out, managers are motivated to run the company with an eye to long-run profitability and not quarter to quarter earnings.**
- Because the common equity of a company is generally no longer publicly traded after a leveraged buy-out, management does not need to be concerned with short-term movements in stock price (including movements which may be caused by quarter-to-quarter results). Also eliminated is the reluctance to make tough decisions because of the fear that the public markets may react negatively. These factors allow management to focus on long-run profitability.

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- A leveraged buy-out causes a more efficient allocation of a company's resources through the incurrence of indebtedness (the "discipline of debt"). Management is required to meet specified repayment schedules and to satisfy various financial covenants which are set forth in loan agreements and indentures. These requirements force management to run the company more efficiently.
- A leveraged buy-out brings to the company the oversight of sophisticated investors who have experience in identifying and achieving operating efficiencies and in arranging financing and overall investment strategies.
- Non-productive assets and operations are converted to cash by sale or disposition, resulting in reduced debt and more efficient operations.

9. Should pension funds be allowed to invest in leveraged buy-outs?

- The pension funds that have invested in leveraged buy-outs sponsored by KKR since 1976 have realized annual compounded rates of return in excess of 40%, benefiting hundreds of thousands of individuals.
- Pension funds typically invest in leveraged buy-outs through funds such as the ones sponsored by KKR. They thus invest their funds in a portfolio of companies which have been purchased by the sponsor on behalf of the fund, and the investment risk is reduced by this diversified approach. Investors in KKR's 1984 Fund, for example, invested in companies in retailing, real estate, budget motels, television stations, cable systems, oil exploration and production, air conditioning and heater manufacturing and printing.
- Pension funds typically have diverse portfolios with leveraged buy-outs constituting only a small percentage of their investments.

10. Do management led buy-outs create conflicts of interest?

- State law has long recognized that conflicts of interest may arise, and courts, applying state law, have singled out mergers and acquisitions, including management buy-outs, for particular attention. These court decisions have held that a company for sale must conduct an open auction, and, if there is a potential conflict of interest, an independent committee of the board of directors must be appointed to conduct the auction process. Independent investment bankers and lawyers are hired to assist the independent committee. After a determination is made by the independent committee, shareholders still have rights under state law, including, generally, the right not to tender their shares if they believe the price offered is inadequate, to file suit challenging the determination of the special independent committee and/or to seek an appraisal of their shares.
- In addition, under Federal law, the Williams Act imposes disclosure requirements aimed at insuring that shareholders are fully informed in deciding whether to accept an offer to sell their company.

11. Do leveraged buy-outs lead to the breaking-up or discontinuance of businesses?

- The sale or disposal of assets is not necessary as a general matter in a leveraged buy-out. In some cases, however, unprofitable businesses will be sold or certain businesses or assets will be sold to help repay debt incurred in the buy-out. In any event, these businesses are not discontinued, and the customers, suppliers and employees of these businesses are generally unaffected by the ownership change. The businesses are either sold to third party buyers (as when Beatrice sold Tropicana to Seagram) or spun-off to continue as smaller stand-alone entities (as when Beatrice spun-off Playtex to its management). The new owners believe that they can operate these businesses more efficiently on a stand-alone basis or within their existing lines of businesses.

- In some cases, such as Duracell which was purchased in a KKR-led leveraged buy-out and has only one line of business, there are no businesses or assets that can be sold.
- As of December 31, 1988, KKR still controlled 6 of the 13 companies acquired by KKR prior to December 31, 1981. As of the same date, the average period of time that KKR had owned its companies (other than those companies acquired within the last 3 years) was over 5 years. The 7 buy-out companies that were purchased by KKR within the last 3 years are still owned by KKR.
- Often, KKR owned companies will acquire other companies subsequent to the buy-out. One recent example is Owens-Illinois, Inc.'s acquisition of Brockway, Inc. in 1988 in a transaction valued at approximately $750 million. Significant acquisitions have also been made by Motel 6, Houdaille Industries, L.B. Foster, Fred Meyer, Malone & Hyde and U.S. Natural Resources.

12. Are leveraged buy-outs a threat to financial institutions?

- Banks typically have a diverse portfolio with leveraged buy-outs constituting only a small percentage of their loans.
- Within a financial institution's leveraged buy-out portfolio there is considerable diversity in the types of businesses to which loans have been made.
- Leveraged buy-outs are not an industry but a financing technique. Therefore, unlike real estate investment trusts, for example, leveraged buy-outs are not overly vulnerable to adverse trends in any particular industry.
- Banks usually sell significant portions of their loans to others, thereby spreading the risk.
- United States bank regulators already possess sufficient powers to deal with any problems which may arise.

13. Do leveraged buy-outs unfairly affect existing bondholders?

- Bondholders of public corporations are either sophisticated investors themselves or are represented in the negotiation of the terms of their bonds by sophisticated investors. Sometimes bondholders or their representatives elect to receive a higher interest rate in return for allowing the issuer more lenient contract terms. If a bondholder or its representative has not obtained or does not elect to obtain contractual protection against the issuer's incurring increased indebtedness, such as in a leveraged buy-out, it is not appropriate for third parties to alter the agreed-upon bargain.
- Many existing bondholders already have obtained protection against an issuer incurring increased indebtedness, such as in a leveraged buy-out, and, in such cases, in order to consummate a leveraged buy-out, the consent of such bondholders must be obtained or their bonds must be repurchased, often at a premium.

OVERVIEW ON LEVERAGED BUY-OUTS

I. Definition of a Leveraged Buy-out

A leveraged buy-out is a financing technique for acquiring a company. Its name is derived from the fact that the acquiror usually borrows a large percentage of the purchase price, typically from a variety of sources, such as commercial banks, insurance companies, other sophisticated financial institutions and/or public purchasers of high yield debt. Occasionally, a portion of the purchase price is paid in the form of securities, which can be debt securities, preferred stock or common stock.

Generally, in a leveraged buy-out a company goes from being a public company to one that is privately held by a small group of investors, such as the investors in KKR's funds. When securities are part of the purchase price paid to the public shareholders, as in the proposed RJR Nabisco transaction, the company remains public.

II. Capital Structure of a Leveraged Buy-out

There is no set capital structure for a leveraged buy-out. Each company is analyzed in detail and a structure is specifically designed to meet the requirements of the situation. Consideration is given to the company's existing and forecasted cash flow, its capital expenditure requirements, its working capital needs and the overall investment strategy with respect to the investment.

A sample capital structure is as follows:

Debt	
Senior Commercial Bank Debt with repayment required in 7-8 years	40%
Senior Subordinated Debt with repayment required in 9-12 years	15%
Subordinated Debt with repayment required in 9-12 years	20%
Equity	
Preferred Stock	15%
Common Equity	10%
Total Capital	100%

The most important aspect of any capital structure is to provide a financial foundation that gives the company the ability to implement its business strategy and permits flexibility in the event of adverse circumstances.

III. Management Participation

In all leveraged buy-outs management has the critical role of managing the investment to maximize its value in the long-term. As a meaningful incentive in KKR sponsored transactions, they usually are given the opportunity to own 10-20% of the company.

IV. Criteria for a Leveraged Buy-out

Only certain companies have the characteristics appropriate to a leveraged buy-out. KKR, on average, has sponsored fewer than 3 transactions in each of its twelve years of existence.

KKR criteria for selecting companies for acquisition include the following:

Financial Characteristics

- A history of demonstrated profitability and the ability to maintain above average profit margins. KKR is not interested in turnaround situations.
- Strong, predictable cash flows to service the financing costs related to the acquisition.
- Readily separable assets or businesses which could be available for sale, if necessary.

Business Characteristics

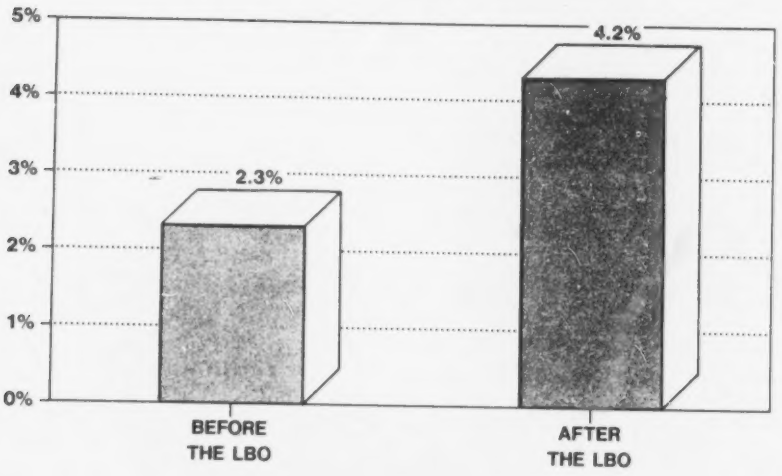
- A strong management team.
- Products with well-known brand names and a strong market position.
- Status as a low cost producer within an industry, thereby creating a competitive advantage.
- Potential for real growth in the future.
- Not subject to prolonged cyclical swings in profitability.
- Products which are not subject to rapid technological changes.

EMPLOYMENT

- The total number of employees in KKR companies has increased from 276,000 in the LBO year to 313,000 three years after the LBOs. The average annual rate of growth has increased from 2.3% before the LBOs to 4.2% after the LBOs.
- Each KKR LBO results in an independent and discrete business which requires that all management functions remain. Therefore, unlike an acquisition by a corporate buyer of another company, where duplicate functions can be eliminated (e.g. corporate office, data processing, plant sites), KKR LBOs do not result in large departmental lay-offs.
- If employment is reduced, reductions are made by existing management. Any reductions would fall predominantly in the corporate overhead area, including, for example, areas such as public relations where specialized help is no longer required because the company is no longer public.
- KKR's goal is to increase the profitability and, thereby, the value of the companies it buys, and, in large part, it does so by growing and building up companies. For a KKR company to reduce productive capacity and thus forego growth and profit opportunity is senseless unless that capacity is uneconomic. In most instances, the cash costs of closings, separation pay and maintenance costs of a closed facility represent a significant penalty supportable only if meaningful future earnings are provided.
- Over the long-term an increase in profitability is likely to lead to the creation of more jobs and increased manhours. For example, in 1984, 100,092,000 manhours were used to operate 1,273 Safeway stores. In 1988, 118,000,000 manhours were used to operate 1,155 Safeway stores.
- When certain businesses are sold by a company after an LBO, employment is also likely to increase in those businesses. Businesses are often sold after a leveraged buy-out because they produce relatively poor returns. The buyers of these businesses expect to make a profit where the seller could not. To turn around these businesses, the buyers will generally have to increase sales, which should be reflected by an increase in jobs.
- KKR does not change the way businesses and employees are managed, except to offer increased incentives through ownership. All management functions are left to the management.

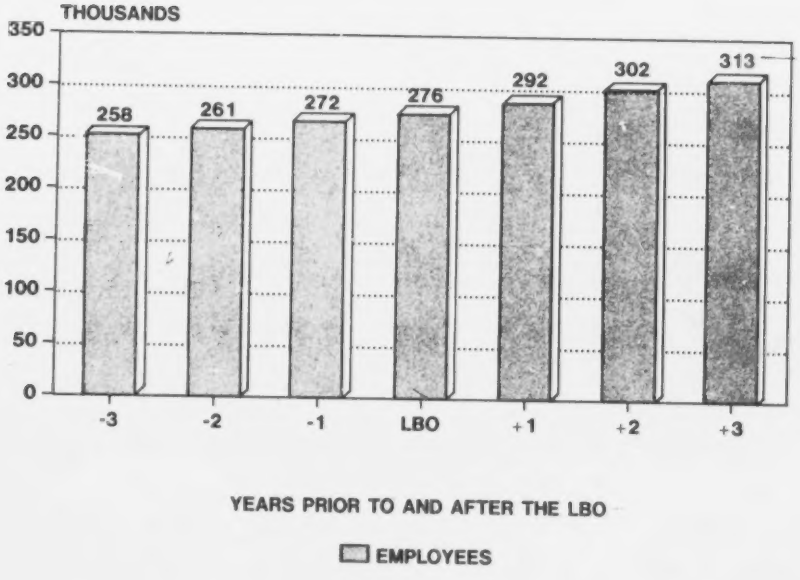
ALL KKR COMPANIES

EMPLOYEE GROWTH RATES



ALL KKR COMPANIES

EMPLOYEES

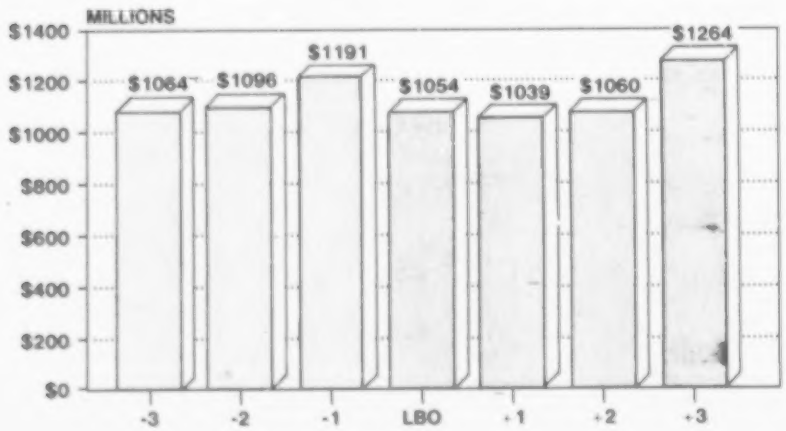


CAPITAL SPENDING

- **KKR does not restrict capital spending.** To the contrary, KKR encourages efficient investment.
- As the charts show, capital spending has remained strong in KKR companies. Capital spending in KKR companies increased from $1.054 billion in the year of the LBOs to $1.264 billion three years after the LBOs. Following a slight decline in the first year immediately following the LBO, capital spending has increased in each year thereafter and in the third year after the LBO has exceeded capital spending in the first year after the LBO by an average of 20%. Capital spending has also been an average of over 14% higher in the third year after the LBO than average capital spending prior to the LBO. It should be noted that capital spending for the year of an LBO is usually committed and not alterable by management.
- The long-run objective of an LBO is to increase the earnings and thereby the value of the company. Capital spending for both growth and cost efficiencies is very important to the achievement of this aim and the consequent improvement of both employee productivity and shareholder returns.
- Management, which after an LBO has a significant ownership interest, increases scrutiny of its capital spending, eliminates marginal projects and increases spending on projects generating high cash flow.

ALL KKR COMPANIES

CAPITAL SPENDING

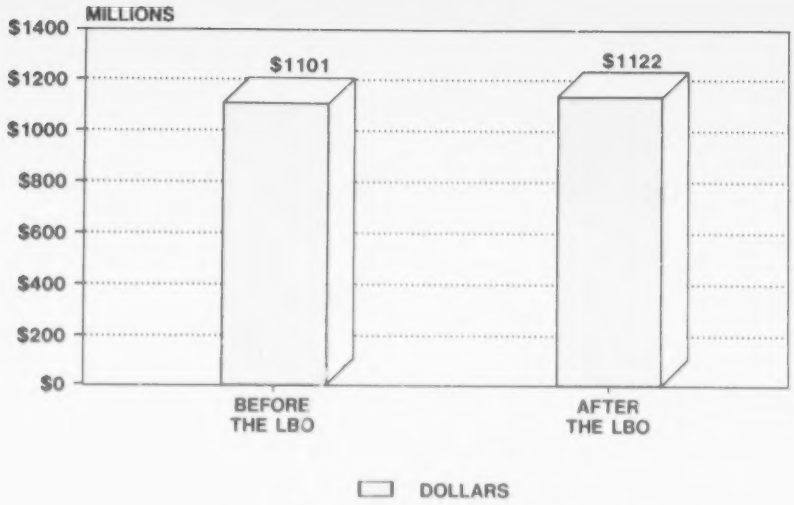


YEARS PRIOR TO AND AFTER THE LBO

DOLLARS

ALL KKR COMPANIES

AVERAGE CAPITAL SPENDING



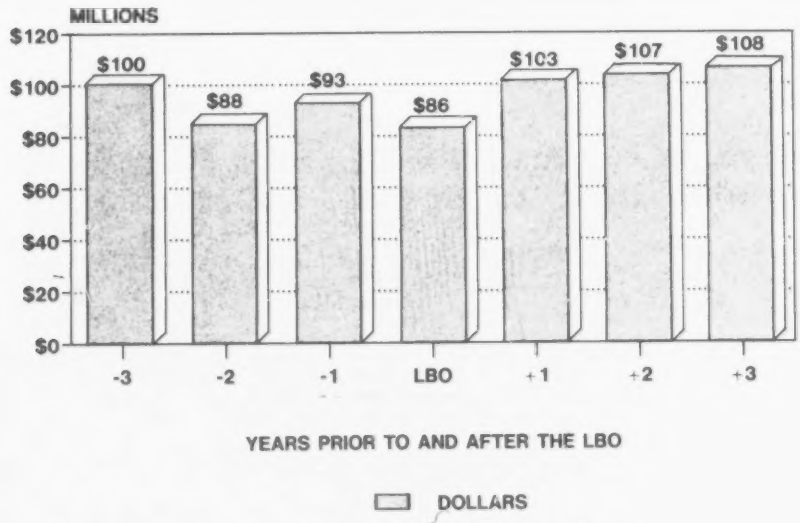
AVERAGE CAPITAL SPENDING INCREASED 1.9%
AFTER THE LBO VERSUS PRIOR TO THE LBO

RESEARCH AND DEVELOPMENT

- **KKR does not reduce research and development spending.** To the contrary, KKR encourages productive research and development.
- Research and development spending in KKR companies increased from $86 million in the year of the LBOs to $108 million three years after the LBOs. As the charts show, KKR companies reversed a downward trend in research and development. During the period following the LBOs, spending on research and development was, on average, 15% higher than during the period preceding the LBOs. In addition, the charts show that KKR companies, on average, increased spending on research and development by 19% immediately after the LBOs.
- Because KKR seeks opportunities to build future value, KKR permits management increased flexibility in spending money on research and development.
- The companies most appropriate for an LBO generally have well-established products, are not in high technology businesses and do not, therefore, require large-scale research and development to remain competitive.
- Research and development is an expense in the year incurred and therefore has a direct negative impact on a company's publicly reported profits. Generally such spending is not worrisome to a post-LBO private company since a private company is not sensitive to market reaction to earnings.

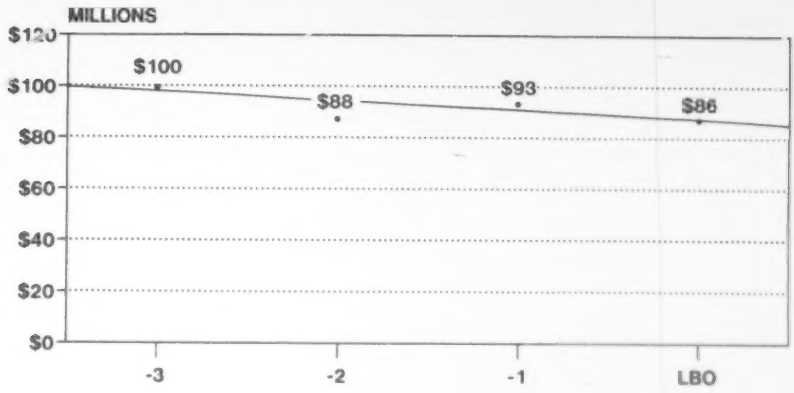
ALL KKR COMPANIES

RESEARCH AND DEVELOPMENT



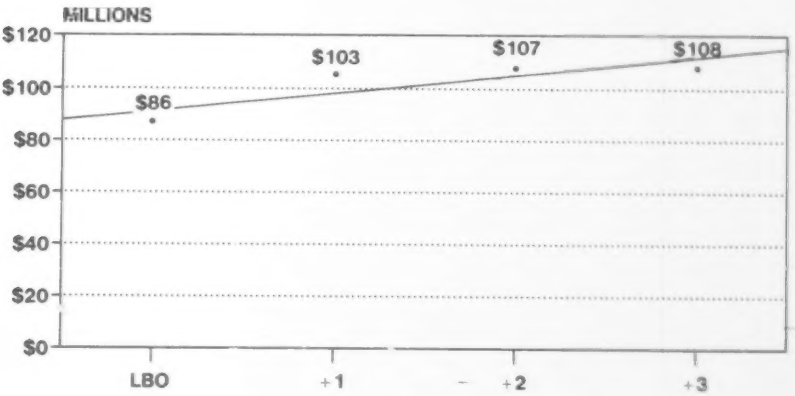
ALL KKR COMPANIES

RESEARCH AND DEVELOPMENT



ALL KKR COMPANIES

RESEARCH AND DEVELOPMENT



TAXES

- LBOs are undertaken primarily to increase long-term profitability and cash flow. They are not undertaken because of tax benefits.
- Recent tax legislation has eliminated tax benefits that were available in LBOs. There are no special tax benefits available to LBOs.
- As the following charts show, KKR estimates that total Federal income taxes paid increased $2.9 billion as a result of the KKR LBOs.
- The primary reasons for this increase in taxes paid are:
  - Interest deductions reduce taxes paid by the LBO company, but interest on LBO debt is taxable to most recipients of the income.
  - Although taxes paid on dividends received by the shareholders of the LBO company decrease after the LBO, capital gains taxes paid by the shareholders of the LBO company increase substantially in the year of the LBO.
  - Taxes are paid on any gains from asset dispositions which follow the buy-out.
  - The KKR equity investors pay substantial additional capital gains taxes upon selling the LBO companies.

TOTAL FOR ALL KKR COMPANIES

A COMPARISON OF FEDERAL INCOME TAXES PAID BY THE COMPANIES, THEIR SHAREHOLDERS, DEBT HOLDERS AND KKR INVESTORS(1)
($ Millions)

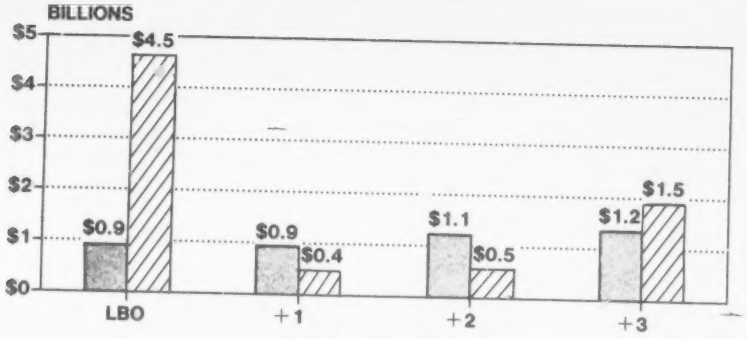
	LBO	+1	+2	+3
Taxes paid—LBO	$4,464	$ 443	$ 516	$1,521
Taxes paid—no LBO	851	947	1,053	1,172
Additional Taxes Paid	3,613	(504)	(537)	349
Cumulative Additional Taxes Paid	3,613	3,109	2,572	2,921

(1) See following charts for details.

ALL KKR COMPANIES

TAX COMPARISON

TAXES PAID



YEARS AFTER THE LBO

NO LBO[1] LBO[2]

[1] TAXES THAT WOULD HAVE BEEN PAID HAD NO LBO OCCURRED.

[2] TAXES PAID AS A RESULT OF LBO.

TOTAL FOR ALL KKR COMPANIES

ASSUMING LBO

FEDERAL INCOME TAXES PAID BY THE COMPANIES, THEIR SHAREHOLDERS, DEBT HOLDERS AND KKR INVESTORS
($ Millions)

	-3	-2	-1	LBO YEAR	+1	+2	+3
Taxes paid by companies(1)	$452	$324	$430	$117	$(130)	$5	$(4)
Taxes paid by shareholders on dividend income(2)	76	75	85	0	0	0	0
Taxes paid by debt holders on interest income(3)	129	190	161	498	573	511	462
Capital gains taxes paid by shareholders and investors(4)	120	133	148	3,849	0	0	1,063
Total taxes paid	777	722	824	4,464	443	516	1,521

(1) Data for year -3 through year -1 represent the actual provisions for federal taxes currently payable. Data for the LBO year through year +3 are estimated based on actual results for companies held for 3 years and actual and projected results for all others.

(2) Based on actual dividends, assuming (i) 60% of dividends received by individuals, 14% by taxable corporations and 26% by tax-exempts and foreigners; (ii) all recipients taxed at current maximum marginal rates; and (iii) all corporate shareholders entitled to 70% dividends received deduction. Distribution of dividend payments is based on the ownership distribution of corporate equities as calculated from 1987 Federal Reserve Bank flow of funds data and 1984 IRS statistics of income.

(3) Based on actual interest paid for year -3 through year -1 and actual and projected interest for the LBO year through year +3, assuming (i) 12% of debt held by individuals, 50% held by taxable corporations and 38% held by tax-exempts and foreigners; and (ii) all recipients taxed at current maximum marginal rates. Distribution of interest payments is based on the ownership distribution of corporate bonds as calculated from 1987 Federal Reserve Bank flow of funds data.

(4) See "Capital Gains Taxes Paid By Shareholders and Investors" table.

TOTAL FOR ALL KKR COMPANIES

ASSUMING NO LBO

FEDERAL INCOME TAXES PAID BY THE COMPANIES, THEIR SHAREHOLDERS, DEBT HOLDERS AND KKR INVESTORS
($ Millions)

	-3	-2	-1	LBO YEAR	+1	+2	+3
Taxes paid by companies(1)	$452	$324	$430	$443	$512	$588	$673
Taxes paid by shareholders on dividend income(2)	76	75	85	84	93	103	115
Taxes paid by debt holders on interest income(3)	129	190	161	160	160	160	160
Capital gains taxes paid by shareholders and investors(4)	120	133	148	164	182	202	224
Total taxes paid	777	722	824	851	947	1,053	1,172

(1) Data for year -3 through year -1 represent the actual provisions for federal taxes currently payable. Data for the LBO year through year +3 are estimated based on actual and projected earnings before taxes, assuming interest deductions equal to the average interest in year -3 through year -1.

(2) Data for year -3 through year -1 are based on actual dividends. Data for the LBO year through year +3 are estimated based on the average ratio of actual dividends to earnings before interest and taxes for year -3 through year -1. Taxes are estimated assuming (i) 60% of dividends received by individuals, 14% by taxable corporations and 26% by tax-exempts and foreigners; (ii) all recipients taxed at current maximum marginal rates; and (iii) all corporate shareholders entitled to 70% dividends received deduction. Distribution of dividend payments is based on the ownership distribution of corporate equities as calculated from 1987 Federal Reserve Bank flow of funds data and 1984 IRS statistics of income.

(3) Based on actual interest paid for year -3 through year -1 and for the LBO year through year +3 assuming interest paid equals average interest paid during year -3 through year -1.

(4) See "Capital Gains Taxes Paid By Shareholders and Investors" table.

TOTAL FOR ALL KKR COMPANIES

CAPITAL GAINS TAXES PAID BY SHAREHOLDERS AND INVESTORS
($ Millions)

YEARS

	-4	-3	-2	-1	LBO	+1	+2	+3	
No LBO:									
Estimated Market Value of All Companies(1)	$9,537	$10,586	$11,750	$13,043	$14,477	$16,070	$17,837	$19,799	
Percent Traded(2)		15%	15%	15%	15%	15%	15%	15%	
Estimated Value of Stock Traded		1,588	1,763	1,956	2,172	2,410	2,676	2,970	
Average Basis of Stock Traded (3)		1,032	1,146	1,272	1,412	1,567	1,739	1,930	
Gain Realized		556	617	684	760	843	937	1,040	
Taxes Paid Assuming No LBO(4)		120	133	148	164	182	202	224	
LBO:									
Gain Realized		556	617	684	17,853(5)			6,861	(6)
Taxes Paid Assuming LBO		120	133	148	3,849			1,063	(7)
Difference Between Taxes Paid Assuming No LBO and Taxes Paid Assuming LBO		$ 0	$ 0	$ 0	$ 3,685	($ 182)	($ 202)	$ 839	CUM DIFF $4,140

(1) Value in the LBO year is the sum of the actual pre-announcement value of the common stock of the companies purchased. Market value in other years was assumed to have increased by an annual factor of 11%, which 11% factor was based upon the actual growth in earnings before interest and taxes from year -3 through year -1.

(2) Calculated from IRS Statistics of Income data on holding periods of stock sold for capital gain. Assumes average turnover of stock held from 0 to 6 months is 12 times per year, and of stock held 6 to 12 months is once a year. Assumes all stock would eventually be sold (no holding until death for step-up in basis).

(3) The average basis of stocks sold for capital gain is estimated to be 65% of the sales price. Such estimate is derived from the data and assumptions described in note 2 and the assumption that the average number of shares sold in each transaction is the same for each holding period.

(4) Distribution of equity ownership and capital gains assumed:

		Tax Rates Assumed:
Individual	60%	28%
Corporate	14%	34%
Tax Exempt	26%	0%
Sum	100%	Average 21.56%

(5) Based on actual purchase price 55.32% above pre-announcement value. Basis of all stock purchased estimated at 32% of pre-announcement value, using data and assumptions stated in notes 2 and 3.

(6) Gains accrued to equity holders through year +3. May not all be realized by end of year +3.

(7) Distribution of LBO Equity Ownership Assumed:

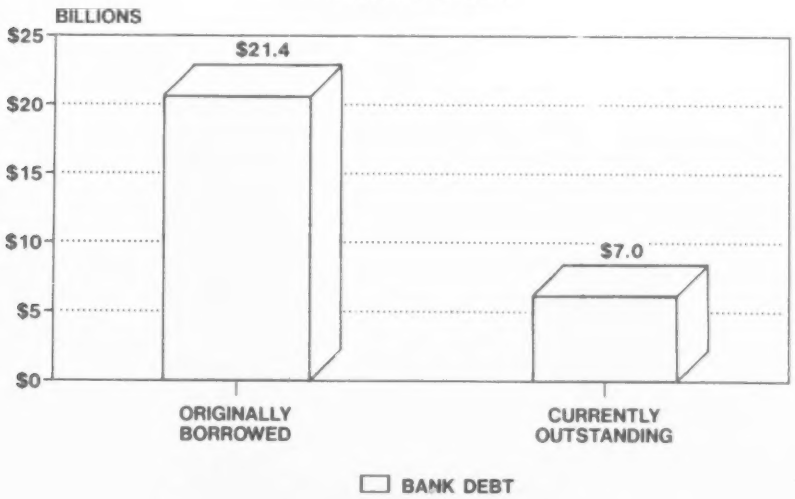
		Tax Rates Assumed:
Individual	25%	28 %
Corporate	25%	34 %
Tax Exempt	50%	0 %
Sum	100%	Average 15.5%

EXTENT AND SIGNIFICANCE OF DEBT

- As shown by the charts, debt is reduced rapidly after a buy-out:
  - Banks lent $21.4 billion to KKR owned companies and of this $14.4 billion has already been repaid on a timely basis. The balance of these borrowings has not yet become due.
  - KKR owned companies have borrowed a total of $33.6 billion from all sources and have already repaid on a timely basis $20.9 billion of this debt. The balance of these borrowings has not yet become due.
  - For all KKR companies, total debt is reduced by over 25% within three years of the buy-out while more than 60% of commercial bank debt is repaid within three years of the buy-out.
- Corporate debt has increased at a slower rate over the last ten years when compared to indebtedness of the United States government and the consumer.
- As a general matter, United States companies are underleveraged compared to foreign competitors.
- The ratio of debt to the market value of equity in the United States industrial sector is 57%, its lowest level in 15 years.
- Because numerous independent lenders at various levels of the capital structure must make a judgement that a particular transaction will be successful before they will make a loan, KKR cannot dictate to these parties that such a loan be made.
- Banks have rapid turnovers of LBO loans through sell-down and the rapidity of repayment.
- See the discussion of the relative extent of current U.S. corporate leverage and of bank participation in LBOs following the charts.

ALL KKR COMPANIES

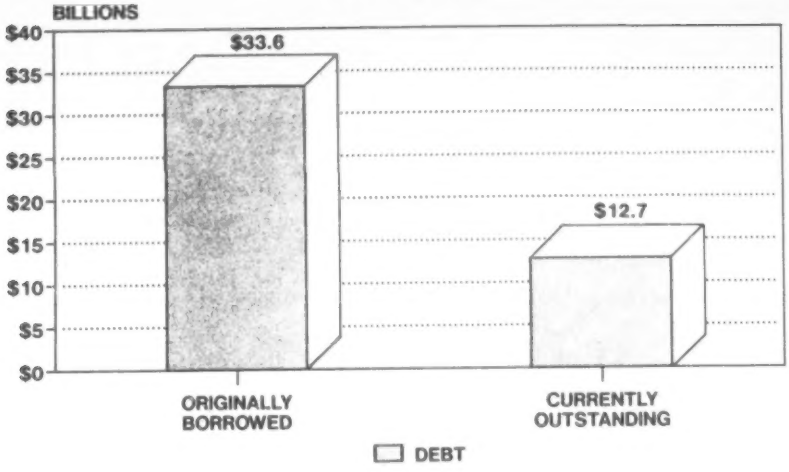
BANK DEBT



REPRESENTS TOTAL BANK DEBT BORROWED BY ALL KKR COMPANIES EVER OWNED (INCLUDING THOSE BUYOUTS IN WHICH KKR HAS SOLD ITS INTEREST) VERSUS BANK DEBT NOW OUTSTANDING

ALL KKR COMPANIES

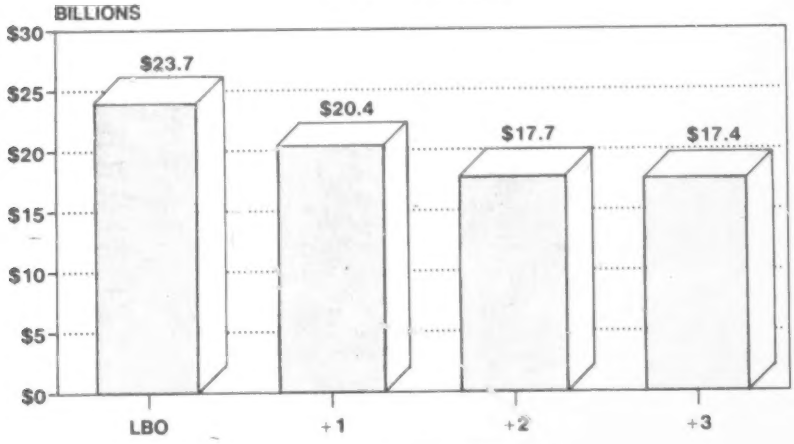
ALL DEBT



REPRESENTS TOTAL DEBT BORROWED BY ALL KKR COMPANIES EVER OWNED (INCLUDING THOSE BUYOUTS IN WHICH KKR HAS SOLD ITS INTEREST) VERSUS DEBT NOW OUTSTANDING

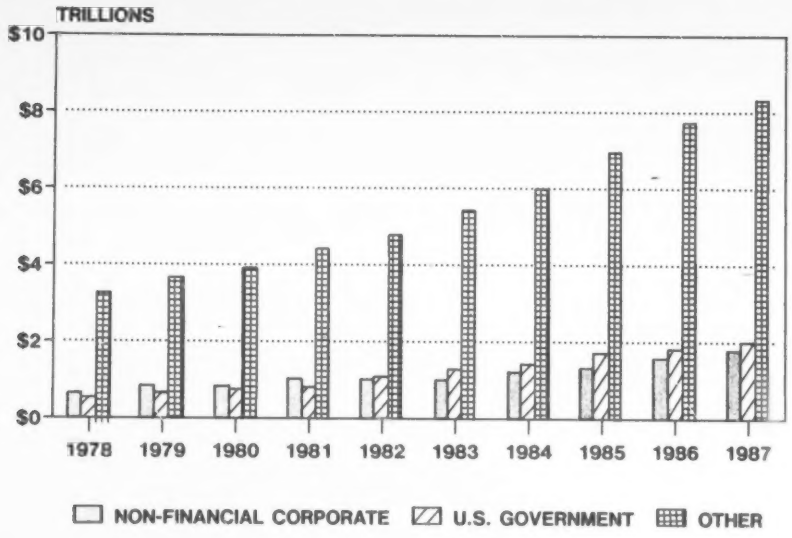
ALL KKR COMPANIES

TOTAL DEBT

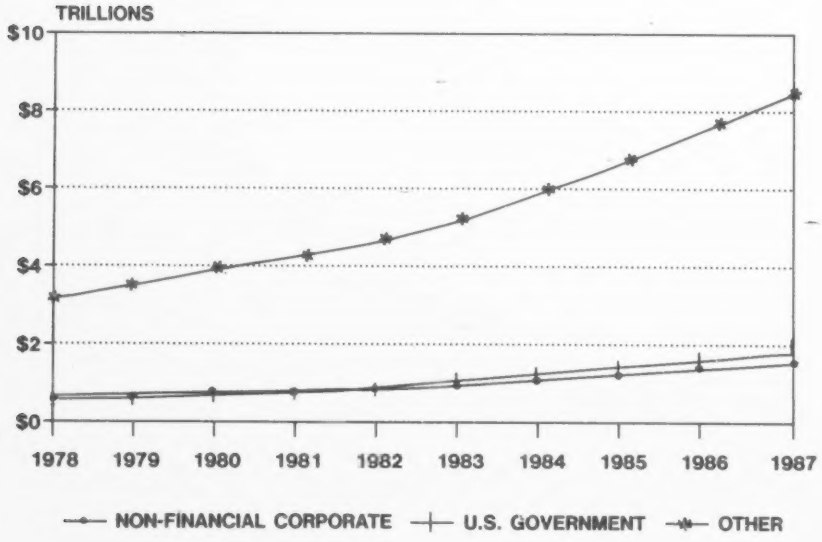


ONLY COMPANIES CURRENTLY OWNED

TOTAL U.S. DEBT OUTSTANDING



TOTAL U.S. DEBT OUTSTANDING



RELATIVE EXTENT OF CURRENT UNITED STATES CORPORATE LEVERAGE

As the following information, derived from various financial industry sources, indicates, United States trading partners generally have higher leverage in the industrial sector than does the United States:

Country	Capitalization Ratios	
	Debt/Book Equity	Debt/Market Value Equity
United States	70%	57%(1)
United Kingdom	70%	40%
Australia	83%	59%
France	105%	75%
Sweden	159%	113%

(1) Lowest since 1973

With the ratio of debt to market value equity in the industrial United States at its lowest level in the last 15 years, it is not surprising to see an increase in the number of acquisitions and releveragings in the United States.

Indeed, a comparison of market value of equity, book value and leverage suggests that the industrial United States may be underleveraged. As the following chart*, which is based on information derived from the five largest companies in selected industries in each country, indicates, the United States is significantly less leveraged than two of its leading trading partners in terms of average debt to equity ratios:

Country	Debt to Equity Ratios	
	Stock Market Value/Book Equity	Debt/Book Equity
United States	1.67	1.22
Japan	2.71	3.63
Germany	2.83	2.33

BANK PARTICIPATION IN LBOS

Because of the significant returns available, major United States banks have participated in and supported LBOs.

A. *Extent of Participation*

Although reliable statistics on LBO lending do not exist, Salomon Brothers has recently estimated that "such lending falls in the range of $175 to $200 billion. A recent Federal Reserve survey of 60 senior lending officers revealed that LBO loans accounted for 9.9% of all commercial loans at banks with assets of $7.5 billion or more and for 5.5% at banks with assets of less than $7.5 billion."**

B. *Bank Losses Related to LBOs*

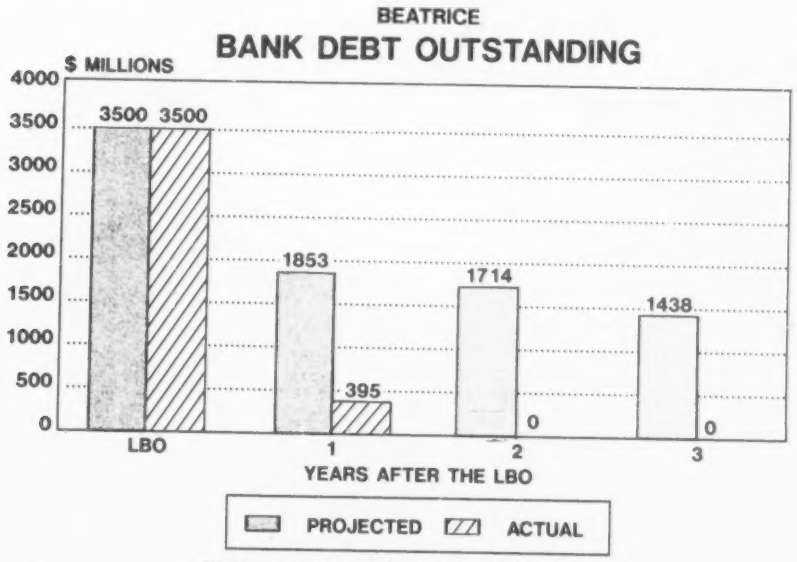
Although reliable statistics on bank losses related to LBOs are also not available, Salomon Brothers has recently observed that, although "LBOs seem to be on the tips of investors' tongues lately, the credit quality of these loans thus far suggests that nonperforming LBO assets are minimal and that actual loan losses are virtually nonexistent. In short, while credit concerns in this area are valid, we sense that the investment community has been overreacting recently to such individual transactions."**

* Taken from Morgan Stanley study on Corporate Restructuring, dated March 12, 1986.

** Taken from Salomon Brothers Stock Research Report on Commercial Banks, dated November 25, 1988.

HOW ACTUAL RESULTS COMPARE TO PROJECTIONS

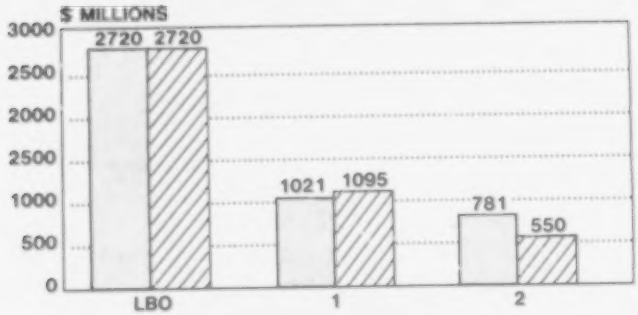
- The charts show that bank borrowings were repaid much more rapidly than had been projected. For example, in the Beatrice LBO, bank debt of $3.5 billion was fully repaid within two years. In the case of Safeway Stores, bank debt started at $2.7 billion and fell within two years to a balance of $550 million even after giving effect to reborrowings of $538 million to redeem shareholder securities.
- KKR has been extremely successful in avoiding over-borrowing in light of potential future conditions because KKR designs its debt structures conservatively. Each LBO has a financial structure and strategy designed to meet its working capital, capital expenditure and other financial requirements. In designing debt structures KKR uses the following guidelines:
  - Debt repayment projections are tested against recession scenarios.
  - Interest rate coverages are tested against a range of interest rate levels.
  - Cash flows are studied to insure that they are sufficient to cover 1%-2% higher average interest rates.
  - No repricings for improved credit are assumed.
  - Generally no available tax refunds are assumed.
  - Generally excess funding is provided for enhanced liquidity/flexibility.
- Also included in Section 12 of this presentation is a case study of what happened to one KKR company when immediately after the buy-out its industries (auto parts, steel and machine tools) went through a period of intense foreign competition while interest rates substantially exceeded expectations.



YEAR 1 INCLUDES $611 OF REBORROWINGS TO REPURCHASE SHAREHOLDER SECURITIES

SAFEWAY

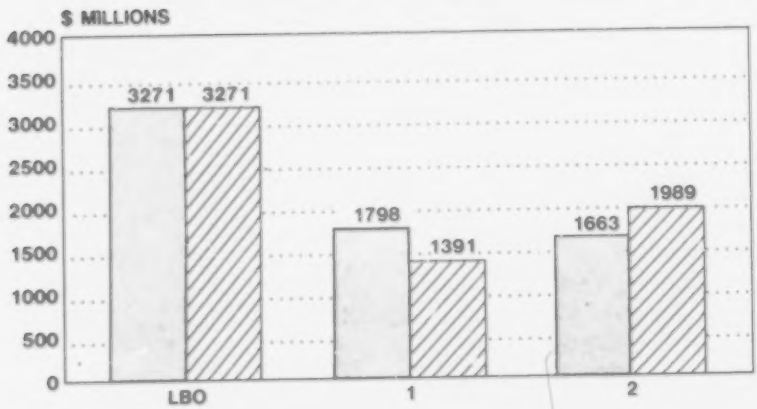
BANK DEBT OUTSTAI 'DING



YEAR 1 REFLECTS REBORROWING OF $538
TO REPURCHASE SHAREHOLDER SECURITIES

OWENS ILLINOIS

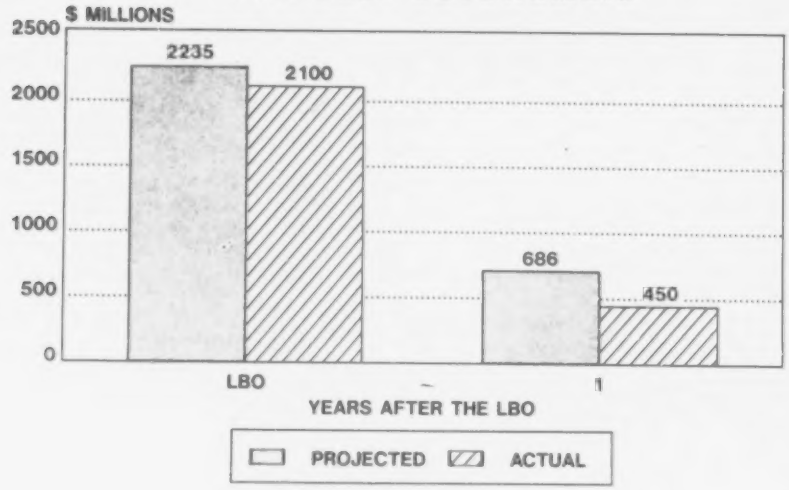
BANK DEBT OUTSTANDING



YEAR 2 REFLECTS BORROWING OF $760
FOR AN ACQUISITION

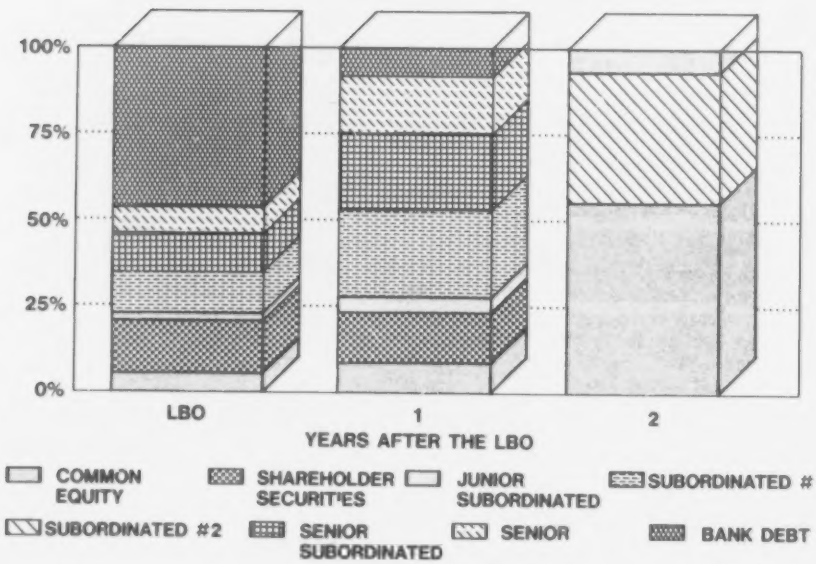
JIM WALTER

BANK DEBT OUTSTANDING



BEATRICE CAPITAL STRUCTURE

TOTAL CAPITAL



YEAR 2 INCLUDES BORROWING OF $526 MILLION TO REPAY SHAREHOLDER SECURITIES

THE HOUDAILLE LBO

A Case Study in the Ability of LBOs to Withstand Economic Adversity

The suggestion has been made that the ability of a firm to weather recessions, rising interest rates or other economic adversity is greatly diminished after an LBO. KKR believes that the experience of Houdaille Industries, Inc. indicates otherwise. Indeed, a company that has undergone an LBO may be much better positioned to deal with such adversities because the management, not faced with quarter to quarter earnings comparisons, is able to focus on balance sheet management (working capital, inventory and receivables, for example) as well as its operating performance.

In 1979, KKR sponsored the first large LBO in which a firm listed on the New York Stock Exchange was taken private. Public shareholders of the company, Houdaille Industries, Inc., received a significant premium on the sale of their shares. Shortly after the LBO, foreign competition, technological change, rising interest rates and a severe recession shook Houdaille. Not only did Houdaille survive these difficulties, but it never defaulted on any of its obligations. Houdaille repaid in full (6 years early) the $60 million in bank borrowing used to accomplish the buy-out, thus, maintaining the credibility and flexibility to borrow $204 million to acquire a company two-thirds its own size within 18 months of the buy-out. Management was able to generate $526 million of cash flow, pay $353 million of interest, retire $233 million of debt and provide cash returns to shareholders of 25% compounded per annum over the life of the buy-out.

In the Houdaille LBO, KKR provided the public shareholders with a substantial premium. The book value of a share of Houdaille common stock as of December 31, 1978 was about $20. Houdaille's stock had ranged in price from $14½ per share to $18⅛ per share in 1977 and in 1978 had traded as low as $14½ per share. On October 25, 1978, KKR offered to buy Houdaille's stock at $40 per share. The price the company's public shareholders received for their shares thus was more than double the price at which the stock had traded in early 1978, immediately before takeover speculation began, and was approximately double book value. This value could not otherwise have been unlocked for many years.

Houdaille's management team essentially remained intact after the LBO. The only management changes involved the retirement of two of the company's most senior managers. Lower-level Houdaille employees also retained their positions.

In the early 1980's, the United States economy suffered its longest and deepest recession since the Great Depression. During this time, interest rates rose dramatically to double-digit levels. In addition to these general causes of economic hardship, problems specific to the industries that constituted Houdaille's major operations hit the company hard: the United States machinery market was invaded by the Japanese, while changes in automobile design forced Houdaille to liquidate two operations that as recently as 1976 had accounted for more than half of its profits.

Faced with these potentially crippling difficulties, Houdaille's management took effective steps to improve the company's competitive position and to maximize cash flow. In addition to liquidating two plants that produced chrome plated automobile bumpers, which had been rendered obsolete by the introduction of rubber and plastic bumpers, the management selected a few other divisions for divestiture. The construction materials and contracting businesses, which were low-margin operations, were sold to smaller owners more suited to handle such enterprises; the power transmission equipment business was sold to a competitor that could achieve synergies unavailable to Houdaille; and the company disposed of two other operations that produced products and served markets not linked with the rest of the company. In response to the sharp decline in industrial activity that occurred between 1982 and 1984, as well as to the significant inroads made by the Japanese, Houdaille also sold two machine tool plants and closed two others which were no longer profitable.

To increase the profitability of its remaining operations, Houdaille sold underutilized equipment, thus freeing space for more modern machinery. It adopted quality-oriented, highly productive manufacturing techniques which sped up production and reduced costs. To control working capital in relation to volume, while maintaining top-level customer service, Houdaille implemented effective manufacturing resource planning systems and other financial control systems. In 1981 and 1984, the company made strategic acquisitions of market-share leaders in the proprietary industrial products industry, thus strengthening its resources in that area. It also strove to increase incentives by instituting a management compensation plan tied to results.

As a result of Houdaille's manufacturing efficiency and cost control programs, productivity (measured by sales output per employee) improved by 36% in the five-year period ending in 1987. By that year, each of the seven business units that comprised the company was a leader in the market it served and was very profitable. Houdaille never defaulted on any of its obligations and in fact established such credibility with its lenders and investors that it was able to make two significant acquisitions—one for $204 million in 1981 and one for $25 million in 1984. The company was recapitalized in 1986, at which time all its lenders received full payment on their loans, including early payment premiums, while its shareholders received approximately a 25% compounded return on their investment. In 1987, a British firm, TI Group, plc, acquired Houdaille, once again providing lenders with full repayment and stockholders with a very significant return on their investment.

All of the Houdaille "constituents"—pre-buy-out shareholders, LBO investors, management, lower-level employees—fared well in the LBO. The public shareholders recognized value upon the sale of their shares to KKR that they might otherwise never have received. As a private enterprise, Houdaille was able to make the tough decisions that were crucial to survival in the early 1980's and to concentrate on cash flow, as opposed to the quarterly profit figures required of public companies. Its management had strong incentives to increase the efficiency and profitability of the company. Despite strong competition from the Japanese, high interest rates and other severely adverse conditions, Houdaille never fell behind on its debt service. Far from weakening the company's ability to survive an economic downturn, the LBO sponsored by KKR significantly improved management's flexibility in dealing with the severe, rapid and adverse changes in the company's operating environment. As a result, not only were all creditors paid in full (including most with early prepayment premiums) but superior returns were realized by the investors.